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An annotated catalog of fossil and subfossil Lepidoptera (Insecta: Holometabola) of the world

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Abstract

In this catalog, we attempt to assemble all fossil records of Lepidoptera described formally or informally in the world literature. A total of 667 records dealing with at least 4,568 specimens have been compiled. They include descriptions of 131 fossil genera and 229 fossil species, as well as 72 extant genera and 21 extant species to which some of these fossils supposedly belong or show superficial similarity. Replacement names of two fossil genera are proposed to avoid homonymy: *Baltopsyche* Sohn, **gen. nov.** for *Palaeopsyche* Sobczyk and Kobbert, 2009 and *Netoxena* Sohn, **gen. nov.** for *Xena* Martins-Neto, 1999. New generic combinations are proposed for: *Tortrix*? *destructus* Cockerell, 1916, *Tortrix florissantanus* Cockerell, 1907, and *Tortrix* sp. sensu Gravenhorst (1835), all three to *Tortricites* Kozlov, 1988; *Pterophorus oligocenicus* Bigot, Nel and Nel, 1986, to *Merrifieldia* Tutt, 1905; *Aporia* sp. *sensu* Branscheid (1969) to *Pierites* Heer, 1849; *Noctua* spp. *sensu* Hope (1836) and Lomnicki (1894), both to *Noctuites* Heer, 1849. Eleven names improperly proposed for lepidopteran fossils are invalidated: *Baltonides roeselliformis* Skalski in Kosmowska-Ceranowicz and Popiolek, 1981; *Baltodines* Kupryjanowicz, 2001; *Barbarothea* Scudder, 1890; *Lepidopterites* Piton, 1936; *Palaeozygaena* Reiss, 1936; *Psamateia calipsa* Martins-Neto, 2002; *Saxibatinca meyi* Skalski in Kristensen and Skalski, 1998; *Spatalistiforma submerga* Skalski, 1976; *Thanatites juvenalis* Scudder, 1875; *Tortricibaltia diakonoffi* Skalski, 1976; and *Zygaenites* Reiss, 1936. An unnecessary subsequent type designation for *Pierites* Heer, 1849, is discussed. A total of 129 records include lepidopteran fossils which cannot be placed in any taxonomic rank. There also exist at least 25 fossil records which lack any evidence of the supposed lepidopteran association. Misidentified specimens, including 18 fossil genera, 29 fossil species and 12 unnamed fossils, are excluded from Lepidoptera. All the known lepidopteran fossils are annotated by fossil type, specimen deposition, excavation locality, association with plants when present, and geological age. A bibliographic list of lepidopteran fossils is provided.

Key words: Nomenclature, paleobiodiversity, paleontology, plant-insect interactions, taxonomy.

Introduction

Fossils provide the most direct window on ancestral lineages and their morphological character states (Hermsen and Hendricks 2007; Cobbett *et al.* 2007) and play an especially important role in tracing the evolutionary history of organisms not represented in the extant fauna. As molecular dating analyses have become common in the last decade (Drummond *et al.* 2006), the value of fossils in evolutionary studies has increased measurably, attributable to their role of providing calibration points for estimating divergence times. Confident dating requires multiple fossils (the more the better; see Pyron 2010) which are securely identified and of appropriate age. However, the availability of such fossils is strongly taxon-dependent.

While the Lepidoptera are one of the so-called "Big Four" insect orders in extant species diversity (Grimaldi and Engel 2005), their fossil record is proportionally very sparse (Kapoor 1981; Labandeira and Sepkoski 1993). Kristensen and Skalski (1998) estimated that only 600–700 total fossil specimens of lepidopterans are known. Taphonomic simulations with extant species suggest that the fragility and buoyancy of the body and wings of Lepidoptera make them especially unlikely to be preserved in lacustrine fossil beds (Duncan 1997), compared to other insect groups. Probably for this reason, amber inclusions and trace fossils such as leaf mines constitute the majority of fossil evidence for Lepidoptera (Skalski 1976a; Kristensen and Skalski 1998; Grimaldi and Engel

2005). Even with amber and trace fossils included, the total fossil record of lepidopterans appears to be much poorer than those of other major insect orders (Labandeira and Sepkoski 1993; Kristensen *et al.* 2007).

Lepidopteran fossils are especially scarce in Mesozoic strata and are known mainly from the Cenozoic (de Jong 2007). This bias was initially taken to mean that Lepidoptera had a more recent history than other groups (Heer 1876). The current consensus is that the Lepidoptera originated during the Early Mesozoic, but that the radiations leading to their modern mega-diversity essentially did not occur until the Paleogene Period (Riek 1970; Kapoor 1981; Ollerton 1999; Grimaldi and Engel 2005). Another widely accepted generalization about the lepidopteran fossil record has been "almost zero extinction" at the family level (Kapoor 1981; Carpenter 1992), as only three families described as fossils are seemingly extinct. Confidence in both of these assertions is undermined, however, by the fact that the lepidopteran fossil record, in addition to being sparse, has been minimally studied. Most lepidopteran fossils have only superficial original descriptions, have never been critically re-examined, and hence have very uncertain taxonomic assignments at present. Many additional fossils remain undescribed in collections. Much of what is known about lepidopteran fossils resides in difficult-to-access publications or unpublished sources. The purpose of the catalog presented here is to make this information more accessible and thereby facilitate expanded study of the lepidopteran fossil record.

Previous efforts to catalog the lepidopteran fossil record have been sporadic. Scudder (1891) and Handlirsch (1907) compiled all fossils which were known at the time. In the most comprehensive but not exhaustive review to date, Kozlov (1988) included all types of lepidopteran fossils, organized in a modern classification. Genus or family-level reviews were provided by Laurentiaux (1953), Danilevsky and Martynova (1962) and Carpenter (1992). Kozlov *et al.* (2002) and Grimaldi and Engel (2005) treated the fossil record of Lepidoptera in the context of evolutionary history. Ross and Jarzembowski (1993) and Labandeira (1994) reviewed the first fossil occurrences of the lepidopteran families. Other surveys have been restricted in time or space or by taxon. Lepidoptera of the Mesozoic were reviewed by Whalley (1986); those of the South American Cenozoic were listed by Petrulevicius and Martins-Neto (2000). Leestmans (1983) summarized the lepidopteran fossils found in France; Meyer (2003) treated the insect fossils of Florissant; Scudder (1875) reviewed butterfly fossils; van Schepdeal (1974) reviewed Palearctic macrolepidopteran fossils; Skalski (1990a) reviewed fossils of primitive Lepidoptera. In comparison to other types of fossils, amber inclusions have been more rigorously cataloged and revised (Kusnezov 1941; Bachofen-Echt 1949; Andrée 1951; Skalski 1976b; Keilbach 1982; Spahr 1989; Poinar 1992). Museum specimen inventories, such as Rasnitsyn and Ross (2000) and Kupryjanowicz (2001), are additional valuable sources and often uncover hidden, unstudied fossils of Lepidoptera.

This catalog attempts to compile all the lepidopteran fossils described or mentioned in the world literature. It also includes as many records as we could find from informal publications such as conference abstracts and theses. Unlike the most extensive previous catalog (Kozlov 1988), it is annotated with specimen data for each fossil, including fossil type, current depository, excavation locality and fossil bed age. The present catalog is a revised and expanded version of an on-line database posted as a part of the Assembling Tree of Life for Lepidoptera project (http://www.leptree.net/fossil). We do not attempt to revise fossil identifications, though we include citations of all the published evaluations of those identifications that we could find. Our primary purpose is to provide in one place as much of the raw information about known lepidopteran fossils as possible, in order to encourage and facilitate further study.

Methods and conventions

Sources and categories. The primary source for references in this catalog is the comprehensive collection of fossil insect literature maintained by one of us (C.C.L.). From this collection we examined publications of all types, in any language, which mention lepidopteran fossils, retrieving as much raw information as possible. In general, only original descriptions were compiled. Subsequent citations also were included when they provided new taxonomic insights or photographs. Data missing from primary sources were added, if possible, using other sources. Ambiguities in the raw data were checked and if possible, corrected. Non-English references were translated by generous colleagues (see Acknowledgments) or using Google Translate (http://translate.google.com).

The name-bearing taxa included here comprise those which are fully described or at least tentatively defined, and for which at least a genus-level association is known. In addition to formally published taxa, we also include

informal records from theses, conference abstracts and newsletters, unless they treat new taxa which are invalid according to the ICZN 4th edition (Article 9). In contrast to previous catalogs, we also compiled undescribed specimens and/or collections of lepidopteran fossils whenever such information was available to us. A number of such specimens were found during inventories of the lepidopteran fossil holdings at several major collections undertaken by the first author during visits in 2009 and 2011.

Whenever possible, we checked the identification of each fossil proposed in the literature against the diagnoses of modern classifications from all the reviews in Kristensen (1998). However, most lepidopteran fossils are incomplete and preserve few diagnostic characteristics. We retained the original taxonomic position of a fossil, even when tentative or suspected to be problematic, unless there was reasonable evidence for a new position. In previous catalogs, such ambiguous fossils have typically been relegated to the category 'Lepidoptera *incertae sedis*.' We see no advantage to this practice, which discards nearly all characteristics observed on such fossils. Instead, we treated ambiguous fossils as "questionably placed" within the subfamily, family or superfamily to which it had originally been assigned. It should be noted, however, that the uncertainty of placement for these fossils can be great. For example, *Phalaenites crenata* Heer, 1849, here designated as questionably placed in Geometridae, may not even belong to Geometroidea or to any currently-recognized macrolepidopteran group.

Our "Lepidoptera *incertae sedis*" section includes only fossils which show no diagnostic characteristics or for which taxonomic affinity was regarded as ambiguous by the describing author, such as when two families were given as possible placements. Fossils never subjected to taxonomic study are also placed in this section. Fossils whose assignment even to Lepidoptera is tentative, suspect or ambiguously stated are placed in the "Putative Lepidoptera" section of this catalog. Last, we include a section entitled "excluded from Lepidoptera" for fossils which were assigned to Lepidoptera at some point but currently are excluded.

Within each section, name-bearing fossils are presented in alphabetical order. Unnamed fossils or collective descriptions thereof are arranged alphabetically by first author of the original record. When sets of different types of fossils were collectively described by the same author, they are listed as separate accounts. Each fossil account accompanies bibliographic citations and, in parentheses, the genus combination or taxonomic interpretation suggested by the author. Our own interpretations and annotations are given in brackets. It is often impossible to determine whether fossil specimens or collections mentioned in multiple papers are mutually exclusive. Hence, some fossils may be doubly counted in our catalog. We tried to minimize such redundancy by checking the institutional catalog numbers of the fossils. When such identifiers are unavailable, we simply point out the possibility of overlap.

Annotation entries. Each account listed in this catalog is annotated as to fossil type, specimen deposition, fossil locality and geological age, in that order, with fields separated by slashes (/). Fields with missing data are described as "unknown" or simply left blank. The formats for each field are as follows:

i) Fossil type. Fossils are classified into ten modes of deposition: amber (AM), asphaltum (AS), compression/impression (CI), copal (CO), gut contents or coprolite of insectivore (GC), peat or lignite (PE), salt deposit (SA), silica permineralization (SI), sieved residue (SR), and trace fossil (T). For extended discussion of the modes of preservation in the insect fossil record, see Labandeira (1999). The categories are not mutually exclusive. For example, leaf-mine fossils are designated as both compression/impression and trace fossil. In such cases, both abbreviations are shown. Subfossils and fossils were not distinguished because these categories are often difficult to separate in literature descriptions and are variably defined, such as Holocene-only occurrences, or older material that has not undergone appreciable fossilization. Following the fossil type, the fossil contents are given in parenthesis, namely, life stage (egg, larva, pupa, and adult) and completeness of preservation (e.g., whole body or fragmentary material).

ii) Specimen deposition. For each fossil we specify the confirmed or best-estimate current location. Acronyms, given below, are used for institutional specimen depositories. For clarity, the names of private collectors are given in full. In the absence of more recent information, the collection name stated by the original author is provided if possible; otherwise the field is left vacant. When the specimen is suspected by previous authors of being lost, we follow their opinion. The following information is given in parentheses. Type status of specimen(s), if any, is reported, using abbreviations listed below. If the specimens are not types, we report only the number of specimens (= exemplars), abbreviated as 'ex.' The type designation or number of specimens is followed, separated by a colon, by the institutional catalog number(s), if these exist. The institutional catalog numbers are cited with the numbers assigned by the original authors.

iii) Excavation locality. The source country is given first, followed by successively more specific locality information. Non-English locality names are provided together with English names when the latter exist. The formal stratigraphic unit, when known, is listed in parentheses and followed by "Fm. (= formation)" if appropriate. The source for the lithostratigraphic age assignment is either taken from the original publication or extrapolated from other geological sources based on the site where the fossil was initially discovered. In some instances formal designation of the formation was not provided in the original fossil description or in related sources. In such cases we recorded a lithological characterization of the sedimentary unit from which the fossil was retrieved without attribution to a particular formation; an example is "East African Copal."

iv) Geological age. The age of the fossil bed is given as geological stage followed by period, using the terminology of Gradstein *et al.* (2004) which presents the internationally accepted standard for geologic time nomenclature. If no age assignment was given by the author or the age of the fossil bed is controversial, we consulted other sources and chose the most persuasive or conservative date.

When possible, records of trace fossils of leaf mines, galls and wood borings include recorded plant hosts. We follow the plant identification given in the original papers, often including the species, genus, and family. Family-level assignments of fossil plant hosts are based on Mabberley (1993).

Occasionally we include a comment field at the end of an account, for example, when there is uncertainty in the original description; an obvious nomenclatural change is inevitable; the author(s) assigned a taxonomic placement to an unnamed fossil; or overlap in content between separate accounts is suspected.

Taxonomy and nomenclature. For most fossils we followed the taxonomic interpretation of the original author or subsequent reviewer. In some cases, we modernized outdated classifications, while in others we had to choose among conflicting classifications advanced by different authors. In the latter instances, we listed all the differing opinions in parentheses and provided bibliographic citations. Clade names and arrangements above the family level follow Nieukerken *et al.* (2011), while the subfamily classification, where applicable, follows Appendix 1 of Kristensen (2003). For some butterflies and bombycoids, the fossils are classified to tribal level as defined in the original descriptions. Taxon names proposed primarily for extant species are given without further details of the original description. We mostly exclude ichnotaxon names, but do use collective generic names (ICZN 4th edition, Article 42) which include ichnospecies, for example, *Stigmellites* Kernbach, 1967.

Extant taxon names often have been used to describe trace fossils by analogy, whether or not the fossil seems likely to belong to the extant taxon. Usage of such analogies varies widely among authors. Some authors state that no taxonomic connection between extant and fossil taxa is implied by the analogy. In such cases, we disregarded the extant analogs as identifiers of the records. We used recent analog names as indicating relationship only when the authors unambiguously state that this is their intention.

We followed the latest version of the code (ICZN 4th edition, effective from 2000) entirely, especially the rules for fossil taxa (Article 20 and 42). We use 'nomen nudum' to denote invalid names, and 'nomen conditionalis' in cases where the author actually meant 'fossil state.' Only the former are invalid under the code (ICZN 4th edition, Glossary).

Collective generic names ending with '-ites' are commonly used for species whose taxonomic placement is not entirely convincing or for which only family-level association is assured (Kozlov 1988). Such names are valid according to the code (ICZN 4th edition, Articles 20, 23.7 and 42.2.1) and are subject to the rules for genus-group nomenclature, except that type designation is not obligatory. Despite this exemption, type species have been designated by subsequent researchers for some collective genera. These secondary type designations can be problematic. For example, Hemming (1967) redesignated *Pierites freyeri* Heer as the type species of *Pierites* Heer, 1849, based on the fact that Heer included only one species. However, *freyeri* was subsequently moved to *Pontia* by Scudder (1875b). As a result, *Pierites* becomes a synonym of *Pontia* and an alternative collective name is required for pierids of uncertain association. We avoided such complicated and seemingly pointless exercises by simply disregarding the subsequent type designation. Finally, when a fossil taxon retains an incorrect species name ending after a change of taxonomic position, we adjust the name as required by the code (ICZN 4th edition, Article 30.1.3).

Abbreviations used. For taphonomy:
AM = amber
AS = asphaltum and tar sands
CI = compression or impression

CO = copal
GC = gut contents or coprolite of insectivorous animals
PE = peat or lignite
SA = salt deposits
SI = silica or other permineralization
SR = sieved residue
T = trace fossil (larval case; mine or other feeding damage)

For type status:
CHT = counterpart of HT
HT = holotype
NT = neotype
PT = paratype
SY = syntype

Institutional specimen depositories, by continent:
[Africa]
BPUW Bernard Price Institute, University of the Witwatersrand, Johannesburg, South Africa, including recently transferred collections from the South African National Botanical Institute at Pretoria.

[Asia]
CNUB College of Life Sciences, Capital Normal University, Beijing, China
IEUH Institute of Evolution, University of Haifa, Israel
KCMK Kumamoto City Museum, Kumamoto, Japan
LBMS Lake Biwa Museum, Kusatsu, Shiga, Japan
NIGP Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, Nanjing, China
NSMT Department of Paleontology, National Science Museum, Tokyo, Japan
OMNH Osaka Prefectural Museum of Natural History, Osaka, Japan
PFDL Paleontological Fossil Depository, Lingu Prov., Shandong, China
SFML Shanwang Fossil Museum, Lingu Prov., Shandong, China
SJCA St. John's College, Agra, Uttar Pradesh, India

[Australia and New Zealand]
GCUA Geological Collection, University of Auckland, Auckland, New Zealand
GDVU Geology Department of Victoria University, Wellington, Australia
GMUQ Geographical Museum, University of Queensland, Queensland, Australia
IGNS Institute of Geological and Nuclear Science, Gracefield Research Centre, Lower Hutt, New Zealand
MVVA National Museum of Victoria, Victoria, Australia
QMSB Queensland Museum, South Brisbane, Australia

[Europe]
AMKR Amber Museum in Kaliningrad, Russia
ANZM Arabako Natur Zientzien Museoa, Natural Sciences Museum of Álava (= Museo de Ciencias Naturales de Álava), Vitoria-Gasteiz, Spain
BGRG Federal Institute for Geosciences and Natural Resources (= Bundesanstalt für Geowissenschaften und Rohstoffe), Hannover, Germany
BMNH Department of Paleontology, Natural History Museum, London, United Kingdom
BPGM Bavarian State Collection for Paleontology and Geology (= Bayerische Staatssammlung für Palaeontologie und Geologie), Munich, Bavaria, Germany
BTVU School of Biosciences and Process Technology, Linnaeus University (= Linnéuniversitetet or Växjö University), Småland, Sweden
CMNH Coburg Museum of Natural History (= Naturkunde-Museum Coburg), Coburg, Germany
DBRD German Amber Museum (= Deutsches Bernsteinmuseum), Ribnitz-Damgarten, Germany

EMUG Institute of Geography and Geology, Ernst Moritz Arndt University (= Institut für Geographie und Geologie, Ernst-Moritz-Arndt-Universität), Greifswald, Germany
ENSM Mines Paris Tech (= École Nationale Supérieure des Mines de Paris or École des Mines de Paris), Paris, France
EPGM Department of Stratigraphy, Paleontology and Marine Geoscience, University of Barcelona (= Departament d'Estratigrafia, Paleontologia i Geociéncies Marines, Universitat de Barcelona), Barcelona, Spain
FMND Fur Museum, Nederby, Denmark
FMUH Paleontological Collection, Geological Museum of Finnish Museum of Natural History (= Luonnontieteellinen Keskusmuseo), University of Helsinki, Helsinki, Finland
FNSF Forschungsinstitut, Nature Museum Senckenberg (= Naturmuseum Senckenberg), Senckenberganlage, Frankfurt, Germany
GBCU Department of General Botany, N. Copernicus University (= Zakład Botaniki Ogólnej, Uniwersytetu M. Kopernika), Torun, Poland
GBNM Heerlen Branch of the Geological Survey, the Netherlands Mining District (= Geologisch Bureau voor het Nederlandse Mijngebied), Heerlen, Netherlands
GMUH Geological and Paleontological Institute and Museum, University of Hamburg (= Geologisch-Paläontologisches Institut und Museum der Universität Hamburg), Hamburg, Germany
GPTUC Institute of Geology and Paleontology, Clausthal University of Technology (= Institute für Geologie und Paläontologie, Technische Universität Clausthal), Clausthal-Zellerfeld, Germany
GPUF Geological and Paleontological Institute, Goethe University Frankfurt (= Geologisch-Paläontologisches Institut, Johann Wolfgang Goethe Universität), Frankfurt, Germany
GPUG Geological-Paleontological Institute, University of Göttingen (= Geologisch-Paläontologisches Institut, Universität Göttingen), Göttingen, Germany
GPUT Institute and Museum for Geology and Paleontology, University of Tübingen (= Institut und Museum für Geologie und Paläontologie, Universität Tübingen), Tübingen, Germany
GSAV Geological Survey of Austria (= Geologische Bundesanstalt), Vienna, Austria
HLDG Museum Wiesbaden (= Hessischen Landesmuseums), Darmstadt, Germany
HNHM Mineral Collection, Hungarian Natural History Museum (= Magyar Természettudományi Múzeum), Budapest, Hungary
IGGB National Institute of Geology and Geophysics (= Institutul Geological Romaniei), Bucharest, Romania
IGMF Center for Geology and Geophysics of Montpellier (= Centre Géologique et Géophysique de Montpellier or l'Institut de Géologie de Montpellier), Montpellier, France
IPEG Institute for Plant Protection Research (= Institut für Pflanzenschutzforschung), Eberswalde, Germany
IPUS Institute for Geology and Paleontology, University of Stuttgart (= Institut für Geologie und Paläontologie, Universität Stuttgart), Stuttgart, Germany
LFUF Agriculture and Forestry Zoological Institute of the University of Helsinki (= Agrikultur-forstvetenskapliga fakulteten, Helsingfors Universitet), Helsinki, Finland
LGUL Laboratory of Geology, University of Lyon (= Laboratoire de Géologie de l'Université de Lyon), Lyon, France
LNHM Lvov Natural History Museum, Lvov, Ukraine
MCFE Civic Museum of Archaeology and Natural Science, "Federico Eusebio" (= Museo Civico Archeologico e di Scienze Naturali Federico Eusebio), Alba, Piedmont, Italy
MCNV Museum of Natural Science in Valencia (= Museo de Ciencias Naturales de Valencia), Valencia, Spain
MEPA Polish Academy of Sciences' Earth Museum (= Muzeum Ziemi Polskiej Akademii Nauk w Warszawie), Warsaw, Poland
MHMM Henrik Madsen Collection, Morsland Historical Museum (= Morslands Historiske Museum), Mors, Denmark
MMAG A.A. Mitchell Collection, Maidstone Museum and Bentlif Art Gallery, Maidstone, England
MNCN National Museum of Natural Science (= Museo Nacional de Ciencias Naturales), Madrid, Spain

MNHN Institute of Paleontology, National Museum of Natural History in Paris (= Institut de Paleontologie, Muséum National d'Histoire Narurelle de Paris), Paris, France
MNHU Berlin Museum of Natural History (= Museum für Naturkunde Berlin or Museum für Naturkunde Humboldt-Universität), Berlin, Germany
MPMV Municipal Museum of Paleontology in Valencia (= Museo Paleontológico Municipal de Valencia), Valencia, Spain
MPUG Museum of Amber Inclusions, Department of Invertebrate Zoology, University of Gdańsk (= Muzeum Inkluzji w Bursztynie, Universytet Gdańsk), Gdańsk, Poland
MTRE Territory Museum in Riccione (= Museo del Territorio, Riccione), Emilia, Italy.
MVMF Natural History Museum of Marseille (= Musée de la Ville de Marseille, France or Museum d'Histoire Naturelle de Marseille), Marseille, France
NASU National Academy of Sciences of Ukraine (Natsional'na Akademiya Nauk Ukrayiny), Kiev, Ukraine
NHMB Natural History Museum in Basel (= Naturhistorisches Museum Basel), Basel, Switzerland
NHMD Geological Museum, Natural History Museum of Denmark, University of Copenhagen (= Geologisk Museum, Statens Naturhistoriske Museum, Københavns Universitet), Copenhagen, Denmark
NHMG Natural History Museum of Graz (= Naturkundemuseum, Universalmuseums Joanneum), Graz, Austria
NHMW Museum of Natural History Vienna (= Naturhistorisches Museum Wien), Vienna, Austria
NHUW Museum of Natural History at University of Wroclaw (= Muzeum Przyrodnicze we Wrocławiu), Wroclaw, Poland
NMLN Natural History Museum of Mainz and Rheinland-Pfalz State Collection for Natural History (= Naturhistorischen Museum Mainz/Landessammlung für Naturkunde Rheinland-Pfalz), Mainz, Germany
NMPC National Museum (= Národní Muzeum or Musei Nationalis Pragae), Prague, Czech Republic
OUNH Oxford University Museum of Natural History, Oxford, United Kingdom
PAML Palanga Amber Museum (= Palangos Gintaro Muziejus), Palanga, Lithuania
PIFU Paleontological Institute, Free University of Berlin (= Wissenschaftliche Einrichtung Paläontologie and Paläontologisches Institut der Freie Universität Berlin), Berlin, Germany
PIRAS Paleontological Institute, Russian Academy of Sciences, Moscow, Russia
PLUW Paleozoological Laboratory, University of Warszawa (= Uniwersytet Warszawski), Warszawa, Poland
PMUZ Paleontological Institute and Museum, University of Zurich (= Paläontologisches Institut und Museum, Universität Zürich), Zurich, Switzerland
PNRL Paleontological collection, Regional Natural Park in Luberon (= Parc Naturel Régional du Lubéron), Lubéron, France
RMOD Amber Museum in Oksbol (= Ravmuseet i Oksbøl), Oksbøl, Denmark
RPMH Roemer and Pelizaeus Museum (= Roemer- und Pelizaeus-Museum), Hildesheim, Germany
SMMG State Museum for Mineralogy and Geology in Dresden (= Staatliches Museum für Mineralogie und Geologie zu Dresden), Dresden, Germany
SMNS Stuttgart State Museum of Natural History (= Staatliches Museum für Naturkunde Stuttgart or Württemberg Royal Natural Cabinet), Stuttgart, Germany
TUBF Faculty of Geosciences, Freiberg Mining Academy, University of Technology (= Sektion Geowissenschaften, Technische Universität Bergakademie Freiberg), Freiberg, Germany
WSIB W. Szafer Institute of Botany, Polish Academy of Sciences (= Polska Akademia Nauk Instytut Botaniki im Władysława Szafera), Kraków, Poland
ZMCD Zoological Museum, Natural History Museum of Denmark, University of Copenhagen (= Zoologisk Museum, Statens Naturhistoriske Museum, Københavns Universitet), Copenhagen, Denmark

[North America]
AIOSU Amber Institute, Oregon State University, Corvallis, Oregon, U.S.A.
ANSP Department of Entomology, Academy of Natural Sciences, Philadelphia, Pennsylvania, U.S.A.
BHM Black Hills Institute of Geological Research (= Black Hills Minerals), Hill City, South Dakota, U.S.A.
CSUM St. Cloud State University in St. Cloud, Minnesota, U.S.A.

DMNH Denver Museum of Nature and Science, Denver, Colorado, U.S.A.
FFNM Florissant Fossil Beds National Monument, Teller Co., Colorado, U.S.A.
FMNH Field Museum of Natural History, Chicago, Illinois, U.S.A.
FMUF Florida Museum of Natural History, University of Florida, Gainesville, Florida, U.S.A
GSCBO Geological Survey of Canada Branch, Dept. of Mines and Technical Surveys, Ottawa, Ontario, Canada
GBIU Department of Geological Sciences and Biology, Indiana University, Bloomington, Indiana, U.S.A.
KNHM Division of Entomology, University of Kansas Natural History Museum, Lawrence, Kansas, U.S.A.
MCZH Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, U.S.A.
NHLA Natural History Museum of Los Angeles County (= Los Angeles County Museum), Los Angeles, California, U.S.A.
PLME Prehistoric Life Museum, Evanston, Illinois, U.S.A.
PMNH Peabody Museum of Natural History, Yale University, New Haven, Connecticut, U.S.A.
PSWC Paul R. Stewart Museum, Waynesburg College, Waynesburg, Pennsylvania, U.S.A.
ROMUT Royal Ontario Museum, University of Toronto, Toronto, Canada
TBMM Thomas Burke Memorial Museum, University of Washington, Seattle, Washington, U.S.A.
UAME University of Alberta Museums, Edmonton, Aberta, Canada
UCMP University of California Museum of Paleontology, Berkeley and Davis, California, U.S.A.
UCNH University of Colorado Museum of Natural History, Boulder, Colorado, U.S.A.
UIMM University of Idaho College of Mines Museum, Moscow, Idaho, U.S.A.
USNM United States National Museum of Natural History, Washington, DC, U.S.A.

[South America]
AOFT Apex (Trinidad) Oilfields, Ltd., near Fyzabad, Trinidad
DGUFC Department of Geology, Federal University of Ceará (= Departamento de Geologia da Universidade Federal do Ceará), Fortaleza, Ceará, Brazil
DGUG Department of Geoscience, University of Guarulhos (= Departamento de Geociências, Universidade de Guarulhos), São Paulo, Brazil
IGEO National Museum and Institute of Geoscience, Federal University of Rio de Janeiro (= Museu Nacional et Instituto de Geociências da Universidade Federal), Rio de Janeiro, Brazil
IGUSP Institute of Geoscience, University of São Paulo (= Instituto de Geociências, Universidade de São Paulo), São Paulo, Brazil
LPUSP Laboratory of Paleontology, Biology Department, FFCL, University of São Paulo campus de Ribeirão Preto (= FFCL/USP campo Ribeirão Preto), Ribeirão, São Paulo, Brazil
MPEF Egidio Feruglio Paleontologic Museum (= Museo Paleontólogico Egidio Feruglio), Trelew, Chubut, Argentina

Other abbreviations:
auct = 'sensu the author' (Latin "of authors")
cf = 'close to' (Latin "compare")
ex = 'number of exemplars' (Latin "copy")
nec = 'not the author' (Latin "and not")
sic = 'misspelling' (Latin "thus")

A catalog of lepidopteran fossils

Note: The annotation at the end of each species account consists of: fossil type/specimen deposition/excavation locality/geological age.

1. Fossils securely placed in Lepidoptera

Order Lepidoptera

Lepidopteran lineages in the polyphyletic Necrotauliidae stock

Comment: Necrotauliidae was proposed by Handlirsch (1906) as a trichopteran family. Since the original description lacked unambiguous definition, the family was later used as a collective group to accommodate "primitive" Trichoptera-like Mesozoic insects (Ansorge 2002). However, stem group Trichoptera are very difficult to distinguish from stem group Lepidoptera. This ambiguity has augmented the heterogeneity of the Necrotauliidae. Ansorge (2002) modernized the definition of the family, restricting it to the genera *Necrotaulius* Handlirsch, 1906 and *Mesotrichopteridium* Handlirsch, 1906. He also redefined *Necrotaulius*, the type genus of Necrotauliidae, to include only the type species, *N. dobbertinensis* Handlirsch, 1906. According to this new definition, the family Necrotauliidae accommodates only stem amphiesmenopterans, that is, those which lived prior to the divergence between Trichoptera and Lepidoptera. Ansorge (2002) found that at least seven genera previously included in Necrotauliidae are indeed lepidopteran lineages. Their placement in the phylogeny of Lepidoptera, however, remains unknown. Since his revision did not cover all necrotauliids in the former broad sense, future studies could reveal additional early lepidopterans within this paraphyletic assemblage.

ARCHIPTILIA Handlirsch, 1939: 97 (Trichoptera); Ansorge, 2002: 71 (Lepidoptera).
Type species: *Archiptilia ovata* Handlirsch, 1939.

ovata Handlirsch, 1939: 97, pl. 9: 168 (*Archiptilia*).
CI (adult: forewing)/EMUG (HT: 123/162)/Germany: Lower Saxony, Mecklenburg, Schwinz near Dobbertin (Posidonia Shale)/early Toarcian, Early Jurassic.

EPIDIDONTUS Handlirsch, 1939: 98 (Trichoptera); Ansorge, 2002: 71 (Lepidoptera).
Type species *Epididontus geinitzianus* Handlirsch, 1939.

geinitzianus Handlirsch, 1939: 98, pl. 9: 170 (*Epididontus*).
CI (adult: forewing)/MNHU (HT: 61.1)/Germany: Lower Saxony, Mecklenburg, Schwinz near Dobbertin (Posidonia Shale)/early Toarcian, Early Jurassic.

METARCHITAULIUS Handlirsch, 1939: 96 (Trichoptera); Ansorge, 2002: 71 (Lepidoptera).
Type species: *Metarchitaulius longus* Handlirsch, 1939.

longus Handlirsch, 1939: 96, pl. 9: 166 (*Metarchitaulius*).
CI (adult: forewing)/EMUG (HT: 123/85)/Germany: Lower Saxony, Mecklenburg, Schwinz near Dobbertin (Posidonia Shale)/early Toarcian, Early Jurassic.

NANNOTRICHOPTERON Handlirsch, 1906: 486 (Trichoptera); Ansorge, 2002: 71 (Lepidoptera).
Type species: *Nannotrichopteron gracile* Handlirsch, 1906.

gracile Handlirsch, 1906: 486, pl. 42: 41 (*Nannotrichopteron*).
CI (adult: forewing)/EMUG (HT: 122/78)/Germany: Lower Saxony, Mecklenburg, Schwinz near Dobbertin (Posidonia Shale)/early Toarcian, Early Jurassic.

NECROTAULIUS auct Ivanov, 2002: 290 (Lepidoptera) (nec Handlirsch, 1906 [Trichoptera]).

tener Sukatsheva, 1990: 97, fig. 96, pl. 8: 10 (*Necrotaulius*); Ivanov, 2002: 290, fig. 3.
CI (adult: whole body)/PIRAS (HT: No. 3015/819)/Russia: Chita Province, Shelopugino District, Unda River at Zhidka (Baleyan Fm.)/Aptian–Albian, Early Cretaceous.
Comment: This fossil was originally assigned to Trichoptera. Later, Ivanov (2002) found it to possess some, though not all, of the apomorphies for Lepidoptera. The definition of *Necrotaulius* is currently restricted to the type

species, *N. dobbertinensis* Handlirsch, 1906 (Ansorge 2002). Therefore, a generic revision for all the remaining tentative "*Necrotaulius*," including *N. tener*, is needed.

PALAEOTAULIUS Handlirsch, 1939: 95 (Trichoptera); Ansorge, 2002: 71 (Lepidoptera).
Type species: *Palaeotaulius vicinus* Handlirsch, 1939.

vicinus Handlirsch, 1939: 95, pl. 9: 164 (*Palaeotaulius*).
CI (adult: forewing)/EMUG (HT: 123/87)/Germany: Lower Saxony, Mecklenburg, Schwinz near Dobbertin (Posidonia Shale)/early Toarcian, Early Jurassic.

PARARCHITAULIUS Handlirsch, 1939: 95 (Trichoptera); Ansorge, 2002: 71 (Lepidoptera).
[Type species: *Pararchitaulius ovalis* Handlirsch, 1939]

ovalis Handlirsch, 1939: 95, pl. 9: 165 (*Pararchitaulius*).
CI (adult: forewing)/EMUG (HT: 123/86)/Germany: Lower Saxony, Mecklenburg, Schwinz near Dobbertin (Posidonia Shale)/early Toarcian, Early Jurassic.

PARATAULIUS Handlirsch, 1939: 96 (Trichoptera); Ansorge, 2002: 71 (Lepidoptera).
Type species: *Parataulius jurassicus* Handlirsch, 1939.

jurassicus Handlirsch, 1939: 97, pl. 9: 167 (*Parataulius*).
CI (adult: forewing)/EMUG (HT: 123/78)/Germany: Lower Saxony, Mecklenburg, Schwinz near Dobbertin (Posidonia Shale)/early Toarcian, Early Jurassic.

PARATRICHOPTERIDIUM auct Ansorge, 2002: 71 (Lepidoptera) (nec Handlirsch, 1906 [Trichoptera]).

efossum Handlirsch, 1939: 100, pl. 10: 175 (?*Paratrichopteridium*).
CI (adult: hindwing)/EMUG (HT: 123/83)/Germany: Lower Saxony, Mecklenburg, Schwinz near Dobbertin (Posidonia Shale)/early Toarcian, Early Jurassic.

costale Handlirsch, 1939: 100, pl. 10: 176 (?*Paratrichopteridium*).
CI (adult: forewing?)/EMUG (HT: 123/84)/Germany: Lower Saxony, Mecklenburg, Schwinz near Dobbertin (Posidonia Shale)/early Toarcian, Early Jurassic.

PSEUDORTHOPHLEBIA Handlirsch, 1906: 485 (Trichoptera); Ansorge, 2002: 71 (Lepidoptera).
Type species: *Pseudorthophlebia platyptera* Handlirsch, 1906.

platyptera Handlirsch, 1906: 485, pl. 42: 40 (*Pseudorthophlebia*).
CI (adult: forewing)/EMUG (HT: 122/76)/Germany: Lower Saxony, Mecklenburg, Schwinz near Dobbertin (Posidonia Shale)/early Toarcian, Early Jurassic.

Suborder *incertae sedis*

Family ARCHAEOLEPIIDAE Whalley, 1985: 159

ARCHAEOLEPIS Whalley, 1985: 159 (Archaeolepiidae); Skalski, 1990a: 125 (?Eolepidopterigidae).
Type species: *Archaeolepis mane* Whalley, 1985.

mane Whalley, 1985: 160, figs. 58–60 (*Archaeolepis*).
CI (adult: wings)/BMNH (HT: In.59397)/United Kingdom: England, Dorset, Charmouth, Black Ven (calcareous flatstone, Turneri Zone, probably Bed 75a)/Sinemurian, Early Jurassic.
Comment: Kristensen and Skalski (1998: 16) regard this as "the oldest known fossil which can with great certainty be referred to the Lepidoptera."

Family MESOKRISTENSENIIDAE Huang, Nel and Minet, 2010: 875

MESOKRISTENSENIA Huang, Nel and Minet, 2010: 875.
Type species: *Mesokristensenia latipenna* Huang, Nel and Minet, 2010.

angustipenna Huang, Nel and Minet, 2010: 879, figs. 4, 5, 8 (*Mesokristensenia*).
CI (adult: whole body)/NIGP (HT: no. 150463)/China: Inner Mongolia, Ningcheng Co., Wuhua township, near Daohugou (Jiulongshan Fm.)/Bathonian–Callovian, Middle Jurassic.

latipenna Huang, Nel and Minet, 2010: 876, figs. 1, 6a–c (*Mesokristensenia*).
CI (adult: whole body)/NIGP (HT: no. 150460)/China: Inner Mongolia, Ningcheng Co., Wuhua township, near Daohugou (Jiulongshan Fm.)/Bathonian–Callovian, Middle Jurassic.

sinica Huang, Nel and Minet, 2010: 877, figs. 3, 7 (*Mesokristensenia*).
CI (adult: whole body)/NIGP (HT: no. 150462)/China: Inner Mongolia, Ningcheng Co., Wuhua township, near Daohugou (Jiulongshan Fm.)/Bathonian–Callovian, Middle Jurassic.

—Huang, Nel and Minet, 2010: 877, figs. 2, 6d (*Mesokristensenia*).
CI (adult: forewing)/NIGP (HT: no. 150461)/China: Inner Mongolia, Ningcheng Co., Wuhua township, near Daohugou (Jiulongshan Fm.)/Bathonian–Callovian, Middle Jurassic.

FAMILY *incertae sedis*

KARATAUNIA Kozlov, 1989: 42.
Type species: *Karataunia lapidaria* Kozlov, 1989.

lapidaria Kozlov, 1989: 42, fig. 1f (*Karataunia*).
CI (adult: whole body)/PIRAS (HT: PIN 2066/3461and3453)/Kazakhstan: Chimkent Oblast, Chayan district, Aulie close to the village of Mikhailovka (Karabastau Fm.)/Oxfordian–Kimmeridgian, Late Jurassic.

GENUS *incertae sedis*

—Grimaldi and Engel, 2005: 562, fig. 13: 16 (basal lepidopteran).
CI (adult: whole body)/AMNH (1 ex: SF46441)/Brazil: Ceará State, ca. 4 km from Santana do Cairiri, Nova Olinda (Crato Fm.)/late Aptian, Early Cretaceous.

Suborder Eolepidopterigina Rasnitsyn, 1983: 468

= Zeugloptera (nec Chapman, 1917); Carpenter, 1992: 372 [part]
= Dacnonypha (nec Hinton, 1946); Kozlov, 1988: 28

Superfamily EOLEPIDOPTERIGOIDEA Rasnitsyn, 1983: 470

Family EOLEPIDOPTERIGIDAE Rasnitsyn, 1983: 470

= Micropterigidae (nec Herrich-Schäffer, 1855); Skalski, 1979a: 92 [for *Undopterix*]
= Undopterigidae Kozlov, 1988: 28 [under Dacnonypha]

Note: Kristensen and Skalski (1998: 16) questioned the monophyly of Eolepidopterigidae which lacks convincing support. Assignment of all taxa other than *Eolepidopterix* to Eolepidopterigidae is tentative. We exclude *Psamateia calipsa* Martins-Neto, 2002, **nomen nudum**, an alleged eolepidopterigid, described from an unpublished thesis. The taxon name was introduced again in Martins-Neto (2005) without description. In fact, the descriptions of *Psamateia* and its type *P. calipsa* have never been published and thus, the taxon names are invalid (ICZN 4th edition, Article 8).

EOLEPIDOPTERIX Rasnitsyn, 1983: 470.

Type species: *Eolepidopterix jurassica* Rasnitsyn, 1983.

jurassica Rasnitsyn, 1983: 470, fig. 1 (*Eolepidopterix*).

CI (adult: whole body)/PIRAS (HT: PIN 3053/416)/Russia: Siberia, Transbaikalia, Chita district, Uda (Udinskaya Fm.)/?Oxfordian, Late Jurassic.

Questionably placed in Eolepidopterigidae

DAIOPTERIX Skalski, 1984: 389.

Type species: *Daiopterix rasnitsyni* Skalski, 1984.

olgae Kozlov, 1989: 38, fig. 1b (*Daiopterix*); Grimaldi and Engel, 2005: 562, fig. 13: 15.

CI (adult: whole body)/PIRAS (HT: PIN 3063/741)/Russia: Tshitinsk region, Shelopugitz district, left bank of the Daia River, 2km above the mouth of the Shiviya River Valley; central Siberia, Chitinsk Oblast (Glushkovo Fm.)/Tithonian–Berriasian, Late Jurassic–Early Cretaceous boundary.

rasnitsyni Skalski, 1984: 390, figs. 1–5 (*Daiopterix*).

CI (adult: whole body)/PIRAS (HT: PIN 3063/922=LEP.FOSS.389 IPM/AWS)/Russia: Tshitinsk region, Shelopugitz district, left bank of the Daia River (Glushkovo Fm.)/Tithonian–Berriasian, Late Jurassic–Early Cretaceous boundary.

GRACILEPTERYX Martins-Neto and Vulcano, 1989: 463.

Type species: *Gracilepterix pulchra* Martins-Neto and Vulcano, 1989.

pulchra Martins-Neto and Vulcano, 1989: 463, figs. 2a–d (*Gracilepterix*).

CI (adult: whole body)/private collection, Maria A. Vulcano, São Paulo, Brazil (HT: CV-1476)/Brazil: Ceará State, ca. 4 km from Santana do Cairiri, Nova Olinda (Crato Fm.)/Late Aptian, Early Cretaceous.

PALAEOLEPIDOPTERIX Kozlov, 1989: 37.

Type species: *Palaeolepidopterix aurea* Kozlov, 1989.

aurea Kozlov, 1989: 38, fig. 1a (*Palaeolepidopterix*).

CI (adult: whole body)/PIRAS (HT: PIN 2239/607)/Kazakhstan: Chimkent Oblast, Chayan district, Aulie close to the village of Mikhailovka (Karabastau Fm.)/Oxfordian–Kimmeridgian, Late Jurassic.

UNDOPTERIX Skalski, 1979a: 92.
Type species: *Undopterix sukatshevae* Skalski, 1979.

cariensis Martins-Neto and Vulcano, 1989: 463, fig. 2f (*Undopterix*).
CI (adult: forewing)/IGUSP (HT: GP/1T-1635)/Brazil: Ceará State, ca. 4 km from Santana do Cairiri, Nova Olinda (Crato Fm.)/Late Aptian, Early Cretaceous.

sukatshevae Skalski, 1979a: 94, figs. 4–6, pl. 9: 1, pl. 10: 1 (*Undopterix*).
CI (adult: whole body)/PIRAS (HT: PIN 3015/815=LEP.FOSS.290/IPM/AWS)/Russia: Chita Province, Shelopugino district, Unda River at Zhidka (Baleyan Fm.)/Aptian–Albian, Early Cretaceous.

NETOXENA Sohn, **gen. nov.** A replacement name for *Xena* Martins-Neto, 1999.
= *Xena* Martins-Neto, 1999: 533. A junior homonym of *Xena* Nartshuk, 1964 [Diptera: Chloropidae].
Type species: *Xena nana* Martins-Neto, 1999.

nana Martins-Neto, 1999: 533, figs. 2–3 (*Xena*). **comb. nov.**
CI (adult: whole body)/LPUSP (HT: RGMN-T030)/Brazil: Ceará State, ca. 4 km from Santana do Cairiri, Nova Olinda (Crato Fm.)/Late Aptian, Early Cretaceous.

GENUS *incertae sedis*

—Skalski, 1990a: 126 (undescribed Eolepidopterigina).
CI (not stated)/not stated/not stated/Late Jurassic–Early Cretaceous.

Suborder Zeugloptera Chapman, 1917 [extant]

= Micropterigina Herrich-Schäffer, 1855

Superfamily MICROPTERIGOIDEA Herrich-Schäffer, 1855 [extant]

Family MICROPTERIGIDAE Herrich-Schäffer, 1855 [extant]

BALTIMARTYRIA Skalski, 1995: 27.
Type species: *Micropteryx* [sic] *proavittella* Rebel, 1936.
= *Paragrionympha*; Skalski, 1976c: 223. Nomen nudum (see Kristensen and Nielsen, 1979: 141).

proavittella Rebel, 1936: 185, fig. 17 (*Micropteryx* [sic]); Whalley, 1977: 526 (*Sabatinca*); Skalski, 1995: 28, figs. 1, 2, 5, 6 (*Baltimartyria*).
= *Micropteryx* [sic] *proavitella* [sic]; Kusnezov, 1941: 69.
AM (adult: whole body)/GPUT (HT: no. 1450/1=LEP.SUCC. 238 IGPT/AWS)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

rasnitsyni Mey, 2011: 333, figs. 1-11 (*Baltimartyria*).
AM (adult: whole body)/MNHU (HT: MB.I 5950)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

MICROPTERIX Hübner, 1825 [extant]
= *Electrocrania* Kusnezov, 1941: 19.
Type species: *Electrocrania immensipalpa* Kusnezov, 1941.
Comment: Kristensen and Skalski (1998: 17) questioned the synonymy of *Electrocrania* with *Micropterix* suggested by Kozlov (1988). They were uncertain whether *Electrocrania* was homoneurous or glossatan.

angelica Jarzembowski, 1980: 263, fig. 49 (*Micropterix*).
CI (adult: partial forewing)/BMNH (HT: In.17411)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/Late Priabonian, Late Eocene.

gertraudae Kurz and Kurz, 2010: electronic source (*Micropterix*).
AM (adult: whole body)/private collection, Michael Kurz, Hallein-Rif, Austria (HT: MK-14295)/Russia: Kaliningrad, Yantarny (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

immensipalpa Kusnezov, 1941: 20, figs. 1–3 (*Electrocrania*); Kozlov, 1988: 26 , fig. 2 (*Micropterix*).
AM (adult: whole body)/PIRAS (HT: no. 8)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Kupryjanowicz, 2001: 62, fig. 80 (*Micropterix*).
AM (adult: whole body)/MEPA (1 ex: no. 15510)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.
Comment: The author stated that this record was based on an identification by Skalski. It could be one of the specimens in Skalski's papers.

—Skalski, 1976b: 199 (*Micropterix*); Skalski, 1990a: 126 [multiple species]; Skalski in Kristensen and Skalski, 1998: 24.
AM (not stated)/not stated (> 2 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

MOLEROPTERIX Engel and Kinzelbach, 2008: 1444.
Type species: *Moleropterix kalbei* Engel and Kinzelbach, 2008.

kalbei Engel and Kinzelbach, 2008: 1445, figs. 1, 2 (*Moleropterix*).
CI (adult: forewing)/KNHM (HT: KU-NHM-ENT FFD-002)/Denmark: Fur Island, Stolleklint Clay (Fur Fm.)/late Thanetian, Late Paleocene.

PALAEOSABATINCA Kozlov, 1988: 26.
Type species: *Palaeosabatinca zherichini* Kozlov, 1988.

zherichini Kozlov, 1988: 27, fig. 3 (*Palaeosabatinca*).
CI (adult: whole body)/PIRAS (HT: PIN 3064/515)/Russia: Transbaikalia, Baisa, left bank of Vitim River (Zaza Fm.)/Hauterivian, Early Cretaceous.

PARASABATINCA Whalley, 1978: 73.
Type species: *Parasabatinca aftimacrai* Whalley, 1978.

aftimacrai Whalley, 1978: 73, pl. 11: 1–3, pl. 12: 1–3, pl. 13: 1, pl. 14: 1 (*Parasabatinca*).
AM (adult: whole body)/BMNH (HT: "embedded in plastic"; PT: 2 ex)/Lebanon: Hammana, Mdeyrij (Lebanese Amber, Grès de Basa Fm. or lateral equivalents)/Hauterivian–Aptian, Early Cretaceous.
Comment: Kristensen and Skalski (1998: 17) confirmed placement of this fossil in the so-called *Sabatinca* group, based on two apomorphies. It is the earliest definitive Micropterigidae.

caldasae Martins-Neto and Vulcano, 1989: 460, figs. 1a–e (*Parasabatinca*).
CI (adult: whole body)/private collection, Maria A. Vulcano, São Paulo, Brazil (HT: CV-146); IGUSP (PT: CD-129, GP/1T-1630); DGUFC (PT: AMA-I-01)/Brazil: Ceará State, ca. 4 km from Santana do Cairiri, Nova Olinda (Crato Fm.)/late Aptian, Early Cretaceous.

SABATINCA Walker, 1863 [extant]

perveta Cockerell, 1919: 23 (*Micropteryx* [sic]); Rebel, 1936: 165 (*Mnesarchaea*); Kusnezov, 1941: 69 (*Dyseriocrania*); Skalski, 1973c: 650 (*Mnemonica*); Whalley, 1977: 526 (*Sabatinca*); Ross and York, 2000: 14, fig. 6.
AM (adult: whole body)/BMNH (HT: In.19135)/Myanmar: Kachin Prov., Hukawang Valley (Burmese Amber, "channel facies" of an unnamed formation)/late Aptian, Early Cretaceous.

—Skalski, 1990a: 126 (*Sabatinca* group) [multiple species].
= *Saxibatinca meyi* Skalski in Kristensen and Skalski, 1998: 24. Nomen nudum [manuscript name].
AM (not stated)/not stated (several specimens)/Germany: Tagebau Goitsche, Bitterfeld Coal Mine (Saxonian Amber, Cottbus Fm.)/Lutetian, Middle Eocene.

—Skalski in Kristensen and Skalski, 1998: 24 (sabatincoid-like micropterigid)
AM (not stated)/not stated (1 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

GENUS *incertae sedis*

—Ansorge, 2002: 72, fig. 15 (two Lepidoptera related to Micropterigidae).
CI (adult: forewing)/MNHU (2 ex: LGA 1500; LGA 2017)/Germany: Mecklenburg, Grimmen (Grüne Serie)/early Toarcian, Early Jurassic.

—Azar *et al.*, 2010: 286, 288, fig. 36c (micropterigid moth).
AM (adult: whole body)/not stated/Lebanon: Hammana, Mdeyrij (Lebanese Amber, Grès de Basa Fm. or lateral equivalents)/Hauterivian–Aptian, Early Cretaceous.

—Grimaldi *et al.*, 2002: 11, fig. 42c (Micropterigidae); Grimaldi and Engel, 2005: 562, fig. 13: 17.
AM (adult: whole body)/AMNH (1 ex: Bu701)/Myanmar: Kachin Prov., Hukawang Valley (Burmese Amber, "channel facies" of an unnamed formation)/late Aptian, Early Cretaceous.

—Martínez-Delclós *et al.*, 1999: 14 (Micropterigidae).
AM (adult: whole body)/?MCNV/Spain: Basque County, Álava, Peñacerrada (Nograro Fm.)/Aptian, Early Cretaceous.
Comment: The author compared wing venation in this fossil to *Parasabatinca* and *Undopterix*. It is possibly the same fossil referred to as "Lepidoptera" by Alonso *et al.* (2000).

—Rasnitsyn and Ross, 2000: 24 (Micropterigidae) [multiple species].
AM (adult: whole body)/BMNH (3 ex: In.20167; In.20168; In.20204)/Myanmar: Kachin Prov., Hukawang Valley (Burmese Amber, "channel facies" of an unnamed formation)/late Aptian, Early Cretaceous.

Questionably placed in Micropterigidae

AULIEPTERIX Kozlov, 1989: 40.
Type species: *Auliepterix mirabilis* Kozlov, 1989
Comment: Kristensen and Skalski (1998: 17) questioned the micropterigid association of this genus due to the lack of apomorphies supporting the relationship.

minima Kozlov, 1989: 40, fig. 1c (*Auliepterix*).
CI (adult: whole body)/PIRAS (HT: PIN 4307/39)/Mongolia: Ara-Khangayskiy Aymak, 6km west of Khotont Somon, the northern part of Ukha (Arkhangai Fm.)/Tithonian–Berriasian, Late Jurassic–Early Cretaceous boundary (Lukashevich, 1996).

mirabilis Kozlov, 1989: 40, fig. 1d (*Auliepterix*).
CI (adult: whole body)/PIRAS (HT: PIN 2997/858,891)/Kazakhstan: Chimkent Oblast, Chayan district, Aulie close to the village of Mikhailovka (Karabastau Fm.)/Oxfordian–Kimmeridgian, Late Jurassic.

GENUS *incertae sedis*

—Kühne *et al.*, 1973: 63, fig. 1 (*Micropterix*); Kozlov, 1988: 54 (uncertain).
AM (adult: 3 types of wing scales)/PIFU (150 ex)/France: Sarthe, Quarry 2.5km S of Durtal (Aquitanian Amber)/Albian–Cenomanian, Early–Late Cretaceous boundary.

—Richter, 1988: 122, fig. 8 (Micropterigidae).
GC (adult: cuticular fragments and wing scales)/FNSF/Germany: Hesse, S Frankfurt, near Darmstadt, Messel oil shale-layers (Messel Fm.)/early Lutetian, Middle Eocene.

—Schlüter, 1974: 254, figs. 1–2 (Micropterigidae); Schlüter, 1975: 157, fig. 5.
AM (adult: wing scales)/?PIFU/France: Durtal, Angouleme Fouras, Rochefort (Aquitanian Amber)/Albian–Cenomanian, Early–Late Cretaceous boundary.

Suborder Glossata Fabricius, 1775

SUPERFAMILY *incertae sedis*

PROTOLEPIS Kozlov, 1989: 41.
Type species: *Protolepis cuprealata* Kozlov, 1989.

cuprealata Kozlov, 1989: 41, fig. 1e (*Protolepis*).
CI (adult: whole body)/PIRAS (HT: PIN 2066/3564)/Kazakhstan: Chimkent Oblast, Chayan district, Aulie close to the village of Mikhailovka (Karabastau Fm.)/Oxfordian–Kimmeridgian, Late Jurassic.
Comment: Kristensen and Skalski (1998: 16) cited this as one of the earliest Glossata but also raised the possibility that its re-examination might not confirm its glossatan relationship.

GENUS *incertae sedis*

—Grimaldi and Engel, 2005: 564, fig. 13: 21 (glossatan moth).
AM (larva: whole body)/AMNH (1 ex: JG 19/70)/Lebanon: Hammana, Mdeyrij (Lebanese Amber, Grès de Basa Fm. or lateral equivalents)/Hauterivian–Aptian, Early Cretaceous.

—Grimaldi and Engel, 2005: 564, fig. 13: 22 (glossatan moth).
AM (adult)/AMNH (1 ex: NJ)/USA: New Jersey, Middlesex Co., Sayreville (New Jersey Amber, Raritan Fm.)/Turonian, Late Cretaceous.

—Grimaldi and Engel, 2005: 568, fig. 13: 28 (glossatan moth).
AM (adult: whole body)/AMNH (1 ex: NJ-638)/USA: New Jersey, Middlesex Co., Sayreville (New Jersey Amber, Raritan Fm.)/Turonian, Late Cretaceous.

—Grimaldi *et al.*, 2002: 11, fig. 42d (Glossata).
AM (adult: whole body)/AMNH (1 ex: Bu187)/Myanmar: Kachin Prov., Hukawang Valley (Burmese Amber, "channel facies" of an unnamed formation)/late Aptian, Early Cretaceous.

—Rust, 1999: 347 (glossatan moth).
CI (adult: various)/MHMM (3 ex: MM 11-A2083; 6M-2127; 14M-5226)/Denmark: Mors Island (Fur Fm.)/late Thanetian, Late Paleocene.

—Wedmann, 2000: 107–108, fig. 46 (glossatan moth) [two species].
CI (pupa)/NMLN (2 ex: no. 5404; no. 8831)/Germany: Rhineland–Palatinate, Westerwald (Enspel Fm.)/Chattian, Late Oligocene.

Superfamily ERIOCRANIOIDEA Rebel, 1901 [extant]

Family ERIOCRANIIDAE Rebel, 1901 [extant]

cf. *ERIOCRANIELLA* Viette, 1949 [extant]

—Opler, 1973: 1321, fig. 1b (cf. *Eriocraniella*).
CI and T (leaf mine)/UCMP/USA: Idaho, Thorn Creek (Payette Fm.)/Tortonian, Late Miocene.
Fossil plant host: Fagaceae —*Quercus simulata* Knowlt.

Questionably placed in Eriocraniidae

ERIOCRANITES Kernbach, 1967: 104 (Eriocraniidae); Kozlov, 1988: 54 (uncertain).
Type species: *Eriocranites hercynicus* Kernbach, 1967. A subsequent designation by Clark *et al.* (1971: 582).

hercynicus Kernbach, 1967: 104, fig. 2 (*Eriocranites*).
CI (adult: wings)/GPUG (HT: 596-1=16283)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).

GENUS *incertae sedis*

—Kozlov *et al.*, 2002: 225, fig. 300 (Suborder Eriocraniina).
CI (adult: whole body)/PIRAS (1 ex: PIN 2784/1933)/Kazakhstan: Karatau (Karabastau Fm.)/Oxfordian–Kimmeridgian, Late Jurassic.

—Skalski, 1990c: 164 [in table] (Eriocraniidae).
AM (not stated)/not stated/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Skalski, 1990c: 164 [in table] (Eriocraniidae).
AM (not stated)/not stated/Myanmar: Kachin Prov., Hukawang Valley (Burmese Amber, "channel facies" of an unnamed formation)/late Aptian, Early Cretaceous.

Superfamily LOPHOCORONOIDEA Common, 1990 [extant]

Family LOPHOCORONIDAE Common, 1973 [extant]

Questionably placed in Lophocoronidae

GENUS *incertae sedis*

—Skalski, 1979c: 63, fig. 1 (Lophocoronidae).
AM (adult: whole body)/not stated/Russia: Siberia, E Taimyr, Taimyr Autonomous Okrug, Chatanga (Taimyr Amber, Kheta Fm.)/Coniacian, Late Cretaceous.
Comment: Nielsen and Kristensen (1996) criticized the assignment of this fossil to Lophocoronidae.

Infraorder Exoporia Dugdale, 1974 [extant]

Superfamily MNESARCHAEOIDEA Eyer, 1924 [extant]

Family MNESARCHAEIDAE Eyer, 1924 [extant]

Questionably placed in Mnesarchaeidae

GENUS *incertae sedis*

—Zherikhin and Sukacheva, 1973: 20 [in table] (Mnesarchaeidae); Rohdendorf and Zherikhin, 1974: 83, fig. 1 [left upper]; Skalski, 1979c: 63.
AM (adult: forewing)/not stated [?PIRAS] (1ex)/Russia: Siberia, E Taimyr, Taimyr Autonomous Okrug, Chatanga (Taimyr Amber, Kheta Fm.)/Coniacian, Late Cretaceous.
Comment: Kristensen and Skalski (1998) doubted the assignment of this fossil to Mnesarchaeidae.

Superfamily HEPIALOIDEA Stephens, 1829 [extant]

Family HEPIALIDAE Stephens, 1829 [extant]

OIOPHASSUS Zhang, 1989: 93.
Type species: *Oiophassus nycterus* Zhang, 1989.

nycterus Zhang, 1989: 94, fig. 75, pl. 20: 4 (*Oiophassus*).
CI (adult: wings)/SFML (HT: s82702)/China: Shandong Prov., Lingu, Shanwang (Shanwang Fm.)/Langhian, Middle Miocene.

OXYCANUS Walker, 1855 [extant]

cf. *antipoda* Herrich-Schäffer, [1853] (*Epiolus*) [extant]; Keble, 1947: 49 (cf. *fuscomaculatus*) [fossil].
SI (larva: whole body)/MVVA (2 ex: P16153; P16154)/Australia: Victoria, Pejark Marsh (unconsolidated sediments)/Late Holocene.

PROTOHEPIALUS Pierce, 1945: 5.
Type species *Protohepialus comstocki* Pierce, 1945.

comstocki Pierce, 1945: 5, pl. 3 and 4 (*Protohepialus*).
= *Protohepialus incertus* (nec Piton, 1940); Skalski, 1990a: 126.
CI (adult: partial wing)/NHLA (HT: no. 3072)/USA: California, Los Angeles Co., SE Puente (Puente Fm.)/Late Miocene.

Questionably placed in Hepialidae

PROHEPIALUS Piton, 1940: 217 (Hepialidae); Carpenter, 1992: 380 (uncertain).
Type species: *Prohepialus incertus* Piton, 1940.

incertus Piton, 1940: 217, pl. 17: 1 (*Prohepialus*).
CI (adult: whole body)/MNHN (HT: no. 426)/France: Cantal, Menat, Puy-de-Dôme (spongio-diatomite beds)/ Selandrian, Middle Paleocene (Wappler *et al.* 2009).

—Jarzembowski, 1976: 13 (*Prohepialus*); Jarzembowski, 1980: 265, figs. 38, 47, 59.
CI (adult: partial forewing or partial hindwing)/BMNH (3 ex: In.17464; In.64528; In.64538)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/Late Priabonian, Late Eocene.

GENUS *incertae sedis*

—Evans, 1931: 99, pl. 12 (Hepialidae).
CI (adult: wing scales)/?GCUA/New Zealand: North Island, Waikato, near Huntly, Glen Afton mine (Waikato Coal Measures)/Priabonian, Late Eocene (Harris, 1984).
Comment: Evans (1931) mentioned that Dr. R. J. Tillyard examined the scales and thought they resembled those of the extant *Wiseana signata* [Hepialidae].

Infraorder Heteroneura Tillyard, 1918

SUPERFAMILY *incertae sedis*

—Rust, 1999: 347, pl. 28: b (Heteroneura gen. et sp. indet.); Rust, 2000b: 579, fig. 1.
CI (adult: whole or partial body)/MHMM (ca. 110 ex: MM 6M-2127; 14M-A2198; 14M-B2249; 14M-B2921; 14M-B2971; 14M-B4328; 14M-2337; I239; I 272; I357; I495; I613; I665; I2315; I3930; VSK2246; 5-3973; 6-3314) and private collection, Erwin Rettig, Nykøbing, Mors, Limfjord, Denmark [now NHMD?] (6 ex: ERK SA97 K28; SA96 O23; KL96 O63; KL94 B51; KL97 R6; SK94 K51)/Denmark: Jutland, Mors Island (Fur Fm.)/late Thanetian, Late Paleocene.

Superfamily NEPTICULOIDEA Stainton, 1859 [extant]

Family NEPTICULIDAE Stainton, 1859 [extant]

ACALYPTRIS Meyrick, 1921 [extant]

—Skalski, 1990a: 127 (*Niepeltia*); Skalski, 1990b: 144 (*Acalyptris*).
CO (adult: whole body)/not stated/Tanzania: Zanzibar Island (East African Copal, unconsolidated sediments)/Late Pleistocene.

ECTOEDEMIA Busck, 1907 [extant]

—Labandeira *et al.*, 1994: 12279, figs. 1a–d (*Ectoedemia*) [multiple species].
CI and T (leaf mine)/FMUF (> 2 ex: UF12701; UF7255 etc.)/USA: Kansas and Nebraska, Braun Ranch, Hoisington and other localities (Dakota Fm.)/late Albian, Early Cretaceous.
Fossil plant host: Undescribed platanoids.
Comment: Kristensen and Skalski (1998) cited this record as the earliest fossil evidence of Nepticulidae and also of the extant genus *Ectoedemia*.

—Skalski, 1976b: 199 (*Ectoedemia*).
AM (adult: whole body)/not stated (1 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

JOHANSSONIELLA Koçak, 1981 [extant], a replacement name for *Johanssonia* Borkowski, 1972.

—Skalski, 1976b: 199 (*Johanssonia*).
CO (not stated)/not stated (1 ex)/not stated/not stated.

cf. *STIGMELLA* Schrank, 1802 [extant]

almeidae Martins-Neto, 1989: 381, pl. 1: c (?*Nepticula*).
CI and T (leaf mine)/IGUSP (HT: GP/1T-1644)/Brazil: São Paulo, Tremembé, along the road that connects Rodovia Presidente Dutra with Campos do Jordão (Tremembé Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.
Fossil plant host: Symplocaceae —*Symplocos* sp.

ulmivora Fologne, 1860 (*Nepticula*) [extant]; Kernbach, 1967: 106, fig. 5 [fossil].
CI and T (leaf mine)/GPUG (1 ex: 596-4=9111)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).
Fossil plant host: not stated [?Ulmaceae].

—Donner and Wilkinson, 1989: 9 (cf. *Stigmella*).
CI and T (leaf mine)/private collection, Christopher Wilkinson, Botswana/Kazakhstan: no details/Turonian, Late Cretaceous.

—Kinzelbach, 1970: 94, 96, fig. 1 (*Stigmella*).
CI and T (leaf mine)/HLDG (1 ex: Me7408)/Germany: Hesse, S Frankfurt, near Darmstadt, Messel oil shale-layers (Messel Fm.)/early Lutetian, Middle Eocene.
Fossil plant host: Moraceae.

—Kuroko, 1987: 119, fig. 1 (*Stigmella*).
CI and T (leaf mine)/private collection, Tachu Koshimizu, Nagano, Japan (1 ex)/Japan: central Honshu, the border between Nagano and Gumma Prefectures (Kabutoiwa Plant Bed)/?Tortonian–Messinian, Late Miocene.
Fossil plant host: Betulaceae —cf. *Betula grossa* Sieb. et Zucc.

—Labandeira, 1998a: 110, figs. 3d–e (*Stigmella*) [2 spp.].
CI and T (leaf mine)/FMUF (2 ex: UF7252; UF16173)/USA: Kansas, Cloud Co., Braun's Ranch (Dakota Fm.)/late Albian, Early Cretaceous.
Fossil plant host: Laurales —*Pabiana kvacekii* Upchurch et Dilcher; an unidentified angiosperm.
Comment: Kristensen and Skalski (1998) cited this record as the earliest fossil evidence of Nepticulidae and also of the extant genus *Stigmella*.

—Labandeira, 2002a: 45, figs. 4a–b (*Stigmella*).
CI and T (leaf mine)/TBMM (1 ex: no. 57293a)/USA: Washington, Whatcom Co., near Bellingham (Chuckanut Fm.)/Lutetian, Middle Eocene.

—Labandeira, 2002a: 45, figs. 4e–g (*Stigmella*).
CI and T (leaf mine)/TBMM (1 ex: no. 76477)/USA: Washington State, Ferry Co., Republic (Klondike Mountain Fm.)/Lutetian, Middle Eocene.
Fossil plant host: Rosaceae —cf. *Sorbus*.
Comment: The author stated that the fossil mine is particularly similar to those made by the extant *Stigmella nylandriella* Tengström and *S. magdalenae* Klimesch.

—Labandeira *et al.*, 1994: 12279, 12280, figs. 1e–h (*Stigmella*) [multiple species].
CI and T (leaf mine)/FMUF (3 ex: UF12712; UF4811; UF12718 etc.)/USA: Kansas and Nebraska, Rose Creek, Hoishington and other localities (Dakota Fm.)/late Albian, Early Cretaceous.
Fossil plant host: Laurales —*Pandemophyllum kvacekii* Upchurch et Dilcher.

—Labandeira *et al.*, 2002b: 2062, fig. 1h (*Stigmella*).
CI and T (leaf mine)/PMNH (1 ex: no. 6367a)/USA: SW North Dakota, Williston Basin, near Marmarth (Hell Creek Fm.)/latest Maastrichtian, Late Cretaceous.
Fossil plant host: Rosaceae —cf. *Rubus*.

—Liebhold *et al.*, 1982: 456, figs. 1–2 (*Stigmella*).
CI and T (leaf mine)/UCMP (1 ex: no. 8437)/USA: Southern Idaho (Trapper Creek Fm.)/early Langhian, Middle Miocene.
Fossil plant host: Berberidaceae —*Mahonia reticulata* (MacGinitie) Brown.

—Opler, 1973: 1321, fig. 1a (*Nepticula*).
CI and T (leaf mine)/UCMP/USA: California, San Luis Obispo Co., Temblor Range (Temblor Fm.)/Middle Miocene.
Fossil plant host: Fagaceae —cf. *Quercus virginiana* Mill.

—Opler, 1973: 1321 (*Nepticula*).
CI and T (leaf mine)/UCMP/USA: Nevada, Nye Co., Cedar Mountains, Upper Goldyke (Esmeralda Fm.)/Serravallian, Middle Miocene.
Fossil plant host: Fagaceae —*Quercus hanibalii* Dorf.

—Opler, 1973: 1321 (*Nepticula*) [2 spp.?].
CI and T (leaf mine)/UCMP (2 ex)/USA: Idaho, Thorn Creek (Payette Fm.)/Middle to Late Miocene.
Fossil plant host: Fagaceae —*Quercus simulata* Knowlt.; *Lithocarpus* sp.

—Opler, 1973: 1321 (*Nepticula*).
CI and T (leaf mine)/UCMP/USA: Nevada, Churchill Co., Buffalo Canyon (Buffalo Canyon Fm.)/Langhian, Middle Miocene.
Fossil plant host: Fagaceae —*Quercus hanibalii* Dorf.

—Opler, 1973: 1321 (*Nepticula*).
CI and T (leaf mine)/UCMP/USA: Nevada, Lyon Co., near Yerington (Aldritch Station Fm.)/Zanclean, Early Pliocene.
Fossil plant host: Fagaceae —*Quercus hanibalii* Dorf.

—Opler, 1973: 1321 (*Nepticula*); Opler, 1974: 74, pl. 7.
CI and T (leaf mine)/UCMP/USA: Nevada, Storey Co., Dead Camel Range (Chloropagus Fm.)/Serravallian, Middle Miocene.
Fossil plant host: Fagaceae —*Quercus wislizenoides* Axelrod.
Comment: The author stated that it is indistinguishable from mines made by living *Nepticula variella* Braun.

—Opler, 1973: 1321 (?*Nepticula*).
CI and T (leaf mine)/UCMP/USA: Oregon, Columbia Plateau, Blue Mountains, Stinking Water (Mascall Fm.)/Serravallian, Middle Miocene.
Fossil plant host: Fagaceae —*Quercus pseudolyrata* (Lesq.).

—Stephenson, 1991: 168, 170 (Mine type TLm1, TLm2a, TLm2b, TLm3); Stephenson and Scott, 1992: 547, figs. 5: b, d, e, f, h, figs. 6: d, e; Lang *et al.*, 1995: 159–162, 165–168, 170, figs. 3a, 3b, 3d, 3g, 3h, 4a–g, 4i–k, 4m, 4n, pl. 2: 2, 3, 7, 9, pl. 3: 1–3, 5, 6 [multiple species].

CI and T (leaf mine)/BMNH (13 ex: V.45868; V.48524; V.48798; V.49808; V.49905; V.50089; V.50460; V.50622; V.50698; V.50731; V.50733; V.50904; V.50952)/United Kingdom: Hampshire, East Dorset, Bournemouth (Branksome Sand Fm.)/Lutetian, Middle Eocene (McElwaine, 1998).

Comment: The authors used analogies to recent leaf mines to characterize the fossils, but it is not clear that they intended to link various fossil taxa with extant species (see Lang *et al.* 1995 for the analog).

—Wilf *et al.*, 2005: 8944 (*Stigmella*).

CI and T (leaf mine)/MPEF/Argentina: Patagonia, Chubut, Laguna del Hunco (Tufolitas Laguna del Hunco)/Ypresian, Early Eocene (Genise and Petrulevicius, 2001).

STIGMELLITES Kernbach, 1967: 104.

Type species: *Stigmellites heringi* Kernbach, 1967. A subsequent designation by Clark *et al.* (1971: 582).

araliae Fritsch, 1882: 6, pl. 2: 7 (*Tinea*); Zherikhin, 1978: 74 (Eriocranioidea); Kozlov, 1988: 30 (*Stigmellites*).

CI and T (leaf mine)/not stated [lost?]/Czech Republic: Bohemia, Perucher-Schichten, Vyšerovic; Bohemia, Perucher-Schichten, Lipenz (Perucher Fm.)/Cenomanian, Late Cretaceous.

Fossil plant host: Araliaceae.

balticus Kozlov, 1988: 30, fig. 4 (*Stigmellites*); Skalski, 1990b: 144 (uncertain).

AM (adult: whole body)/private collection, K. M. Sadilenko, Moscow, Russia (HT: no. 15-1-4)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

carpiniorientalis Straus, 1977: 60, fig. 62 (*Stigmellites*).

CI and T (leaf mine)/GPUG (HT: 22763; PT: 22134)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).

Fossil plant host: Betulaceae —*Carpinus orientalis* Mill. [extant].

centennis Jarzembowski, 1989: 448 (?*Stigmellites*).

= Mine type 2; Crane and Jarzembowski, 1980: 633, fig. 4, 9.

CI and T (leaf mine)/BMNH (HT: In.64549)/United Kingdom: S England, Berkshire, Newbury, Cold Ash (Reading Fm.)/Thanetian, Late Paleocene.

Fossil plant host: ?Fabaceae.

fossilis Heyden, 1862: 77, pl. 10: 2 (*Nepticula*); Opler, 1973: 1321 (dipterous mine); Kozlov, 1988: 31 (*Stigmellites*).

CI and T (leaf mine)/originally collection of the Senckenberg Nature-Study Society, Frankfurt [not found, probably lost]/Germany: Rhineland, Wetterau and Röhn, Niederrhein, Siebengebirge (Rott Fm.)/Chattian, Late Oligocene.

Fossil plant host: Juglandaceae —*Juglans acuminata* Braun.

gossi Jarzembowski, 1989: 448 (?*Stigmellites*).

= Mine type 1; Crane and Jarzembowski, 1980: 632, figs. 6, 8.

CI and T (leaf mine)/BMNH (HT: In.64547; PT: In.64548)/United Kingdom: S England, Berkshire, Newbury, Cold Ash (Reading Fm.)/Thanetian, Late Paleocene.

Comment: Crane and Jarzembowski (1980) stated that this mine is similar to an unidentified species of *Stigmella* on *Quercus cerris* L.

heringi Kernbach, 1967: 104, fig. 3 (*Stigmellites*).

CI and T (leaf mine)/GPUG (HT: 596-2=11137)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2002).

kzyldzharicus Kozlov, 1988: 32, fig. 5, pl. 2: 1 (*Stigmellites*); Grimaldi and Engel, 2005: 572, fig. 13: 32.
= Eriocraniidae mine; Zherikhin, 1978: 79.
= Nepticulidae mine; Skalski, 1979c: 64.
CI and T (leaf mine)/PIRAS (HT: PIN 2383/206; PT: PIN 2383/214)/Kazakhstan: Kzyl-Ordinsky Region, Chilinsky, northwest spur of Karatau mountain range, Kzyl-Dzhar (Beleuty Fm.)/Turonian, Late Cretaceous.
Fossil plant host: Platanaceae —*Platanus ambicula* Vachr.; *Platanus* sp.

messelensis Straus, 1976: 446 (*Stigmellites*).
= "worm or larva": Bornhardt, 1975: 471.
CI and T (leaf mine)/not stated (in unspecified private collector's possession)/Germany: Hesse, S Frankfurt, near Darmstadt, Messel oil shale-layers (Messel Fm.)/early Lutetian, Middle Eocene.

pliotityrellus Kernbach, 1967: 106, fig. 4 (*Stigmella*); Kozlov, 1988: 32 (*Stigmellites*).
CI and T (leaf mine)/GPUG (HT: 596-3=3050)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).
Fossil plant host: Fagaceae —*Fagus* sp.

samsonovi Kozlov, 1988: 33, pl. 2: 3 (*Stigmellites*).
CI and T (leaf mine)/PIRAS (HT: PIN 2383/209)/Kazakhstan: Kzyl-Ordinsky Region, Chilinsky, northwest spur of Karatau mountain range, Kzyl-Dzhar (Beleuty Fm.)/Turonian, Late Cretaceous.
Fossil plant host: Cercidiphyllaceae —*Trochodendroides arctica* (Heer) Berry.

serpentina Kozlov, 1988: 32, pl. 2: 2 (*Stigmellites*).
CI and T (leaf mine)/PIRAS (HT: PIN 2383/205)/Kazakhstan: Kzyl-Ordinsky Region, Chilinsky, northwest spur of Karatau mountain range, Kzyl-Dzhar (Beleuty Fm.)/Turonian, Late Cretaceous.
Fossil plant host: Cercidiphyllaceae —*Trochodendroides arctica* (Heer) Berry.

sharovi Kozlov, 1988: 33, pl. 2: 4 (*Stigmellites*).
CI and T (leaf mine)/PIRAS (HT: PIN 2383/208)/Kazakhstan: Kzyl-Ordinsky Region, Chilinsky, northwest spur of Karatau mountain range, Kzyl-Dzhar (Beleuty Fm.)/Turonian, Late Cretaceous.
Fossil plant host: Cercidiphyllaceae —*Trochodendroides arctica* (Heer) Berry.

tyshchenkoi Kozlov, 1988: 33, pl. 2: 5 (*Stigmellites*).
CI and T (leaf mine)/PIRAS (HT: PIN 2383/211)/Kzyl-Ordinsky Region, Chilinsky, northwest spur of Karatau mountain range, Kzyl-Dzhar (Beleuty Fm.)/Turonian, Late Cretaceous.
Fossil plant host: Platanaceae —*Platanus latior* Knowlt.

zelkovae Straus, 1977: 61, fig. 14 (*Stigmellites*).
CI and T (leaf mine)/GPUG (HT: no. 23973)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).
Fossil plant host: Ulmaceae —*Zelkova* sp.
Comment: Straus (1977) attributed this fossil to *Stigmellites* because of its similarity to extant nepticulid leaf mines.

—Jarzembowski, 1995: 146 (*Stigmellites*).
CI and T (leaf mine)/BMNH/United Kingdom: Hampshire, East Dorset, Bournemouth (Branksome Sand Fm.)/Lutetian, Middle Eocene (McElwaine, 1998).

—Jarzembowski, 1980: 270, fig. 50 (species A); Kozlov, 1988: 32 (*Stigmellites*).
CI (adult: whole body)/BMNH (1 ex: I.9492)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.
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—Jarzembowski, 1980: 271 (species B); Kozlov, 1988: 32 (*Stigmellites*).
CI (adult: whole body)/BMNH (1 ex: In.64540)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

GENUS *incertae sedis*

—Opler, 1973: 1321 (nepticulid mine).
= "galleries"; Berry, 1916: 32, pl. 23: 3, pl. 31: 1, 3, pl. 38: 4, pl. 39, pl. 92.
= "healed wounds on leaf"; Brooks, 1955: 4, 6, pl. 1: 5.
CI and T (leaf mine)/USNM/USA: Tennessee, Henry Co., SW of Puryear, Wilcox deposits (Claiborne Fm.)/late Ypresian, Early Eocene.
Fossil plant host: ?Proteaceae —*Proteoides wilcoxensis* Berry.

—Donner and Wilkinson, 1989: 9 (Nepticulidae) [multiple species?].
CI and T (leaf mine)/GDVU/not stated/Middle Miocene.

—Donner and Wilkinson, 1989: 9 (Nepticulidae) [multiple species?].
CI and T (leaf mine)/not stated (2 ex)/North America: no details/Middle Miocene.

—Labandeira, 2002b: 49, 252, fig. 2.10e (Nepticulidae).
CI and T (leaf mine)/USNM /USA: Wyoming, Washakie Co., Big Cedar Ridge (Meeteetsee Fm.) /early Maastrichtian, Late Cretaceous.
Fossil plant host: Cercidiphyllaceae —*Cercidiphyllum* sp.

—Peñalver and Delclòs, 2004: 82, fig. 6: 2. pl. 2: 2 (Nepticulidae).
= "leaf-mine"; Peñalver and Delclòs, 1997: 150, fig. 1.
CI and T (leaf mine)/MCNV (1 ex: MPV RIB-242)/Spain: Castellón Prov., near Ribesalbes, "La Rinconada" site (bituminous rhythmites)/Aquitanian, Early Miocene.
Fossil plant host: Lauraceae —*Laurophyllum* sp.

—Skalski, 1979c: 64 (Nepticulidae); Boucot, 1990: 108, fig. 102.
CI and T (leaf mine)/?PIRAS/Kazakhstan: Karatau (Karabastau Fm.)/Oxfordian–Kimmeridgian, Early Jurassic.
Fossil plant host: Cercidiphyllaceae —*Trochodendroides arctica* (Heer) Berry.

—Stephenson, 1991: 154–156, 163 (Mine type KLmla, KLm1b, KLm1c, KLm2, KLm3, KLm11) [multiple species].
CI and T (leaf mine)/GBIU (32 ex: IU15706-4811; IU15706-7525; IU15706-7528; IU15709-4818; IU15709-7531; IU15709-7535; IU15706-4539; IU15706-7521; IU15706-7525; IU15706-7527; IU15706-4810; IU15703-3856; IU15703-7523a; IU15706-7255; IU15706-7256; IU15709-3950; IU15709-4819; IU15713-4696; IU15713-4834; IU15713-4936; IU15713-7242; IU15713-7243; IU15713-7244; IU15713-7245; IU15713-7246; IU15723-7247; IU15713-7248; IU15713-7249; IU15713-7324; IU15706-4536; IU15706-7113; IU15714-7250)/USA: Kansas and Nebraska, Braun Ranch, Hoisington and other localities (Dakota Fm.)/late Albian, Early Cretaceous.
Comment: The author suggested that recent analogs of these fossils are leaf mines caused by various species of *Stigmella* and other nepticulid moth larvae.

Questionably placed in Nepticulidae

—Rozefelds, 1988a: 4, figs. 3a–c (Nepticulidae) [multiple species].
CI and T (leaf mine)/MVVA (1 ex: NMVP183064)/Australia: Victoria, Alcoa Anglesea Coal Mine, S38°25′ E144°11′ (Eastern View Fm.)/Priabonian, Late Eocene.

Fossil plant host: Lauraceae.

—Rozefelds, 1988b: 77, fig. 2 (Nepticulidae); Labandeira *et al.* 1994: 12281 (?Nepticulidae).
CI and T (leaf mine)/QMSB (1 ex: QMF15346)/Australia: North Queensland, Cape York Peninsula, Cape Melville, Clack Island (Battle Camp Fm.)/Tithonian–Berriasian, Late Jurassic–Early Cretaceous boundary.
Fossil plant host: Umkomasiaceae —*Pachyteris crassa* (Halle) Townrow.
Comment: If this mine indeed is a nepticulid lepidopteran, it would establish the clade on a preangiospermous seed-fern lineage, the Umkomasiaceae (Corystospermales).

Clade Eulepidoptera Börner, 1939 [extant]

Clade Incurvariina Börner, 1939 [extant]

Superfamily ADELOIDEA Bruand, 1850 [extant]

Family HELIOZELIDAE Heineman and Wocke, 1876 [extant]

cf. *ANTISPILA* Hübner, 1825 [extant]

—Labandeira, 2002a: 45, figs. 4l–n (cf. *Antispila*).
CI and T (leaf mine)/TBMM (1 ex: no. 36831)/USA: Washington State, Ferry Co., Republic (Klondike Mountain Fm.)/early Lutetian, Middle Eocene.
Fossil plant host: Myricaceae —*Comptonia columbiana* Dawson.

GENUS *incertae sedis*

—Skalski, 1976b: 199 (Heliozelidae).
AM (not stated)/not stated (1 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Family ADELIDAE Bruand, 1850 [extant]

***ADELA* Latreille,** 1796 [extant]

kuznetzovi Kozlov, 1987: 59, fig. 1a (*Adela*).
AM (adult: whole body)/PAML (HT: Ap-1484)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

similis Kozlov, 1987: 60, fig. 1b (*Adela*).
AM (adult: whole body)/PAML (HT: Eo-14160/Ap-3466)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

ADELITES Rebel, 1934a: 373.
Type species: *Adelites electreella* Rebel, 1934.

acutitarsellus Rebel, 1936: 168, fig. 2 (*Prophalonia*); Skalski, 1976b: 201 (?*Prophalonia*); Kozlov, 1988: 29 (*Adelites*).
= *Adelites scutitarsella* [sic]; Keilbach, 1982: 313.

AM (adult: whole body)/MNHU (HT: MB-L5)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

electreellus Rebel, 1934a: 15 (*Adelites*).
= "*Adelites*"; Rebel, 1934b: 373 [no description].
= *Adelites electrella* [sic]; Keilbach, 1982: 313.
AM (adult: whole body)/BPGM (HT: L-3)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

purpurascens Rebel, 1936: 184 (*Adelites*); Kusnezov, 1941: 68 (?*Adelites*).
AM (adult: whole body)/BPGM (HT: no. 179)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

serraticornellus Rebel, 1936: 183, fig. 16 (*Adelites*).
AM (adult: whole body)/GPUT (HT: 3B662)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

GENUS *incertae sedis*

—Skalski, 1990a: 127 (Adelidae) [multiple species].
AM (not stated)/not stated/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Family INCURVARIIDAE Spuler, 1898 [extant]

INCURVARIA Haworth, 1828 [extant]

cf. *oehlmanniella* Hübner, 1796 (*Tinea*) [extant]; Straus, 1977: 59, fig. 44 [fossil].
CI and T (leaf mine)/GPUG (1 ex: no. 15427)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).
Fossil plant host: ?Ericaceae —cf. *Vaccinium*.

—Hering, 1957 (*Incurvaria* sp.) [extant]; Straus, 1977: 59–60, fig. 55 [fossil].
CI and T (leaf mine)/GPUG (1 ex: no. 21313)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).
Fossil plant host: Berberidaceae —*Berberis* sp.

—Skalski, 1990a: 127 (*Incurvaria*).
CI and T (leaf mine)/not stated/not stated/Pliocene.

PROPHALONIA Rebel, 1936: 167 (Tortricidae); Skalski, 1973b: 342 (Tineoidea); Skalski, 1976b: 200 (Incurvariidae).
Type species: *Prophalonia gigas* Rebel, 1936.

gigas Rebel, 1936: 167, fig. 1 (*Prophalonia*).
AM (adult: whole body)/MNHU (HT: MB-L4)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

GENUS *incertae sedis*

—Kupryjanowicz, 2001: 62 (Incurvariidae).
AM (adult: whole body)/MEPA (1 ex: no. 17864)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.
Comment: The author stated that this record was based on an identification by Skalski.

—Labandeira, 1998b: 20, fig. 2d (Incurvariidae).
CI and T (leaf mine)/USNM/USA: Utah, Uintah Co., Bonanza locality (Green River Fm.)/Ypresian, Middle Eocene.
Fossil plant host: Platanaceae —*Macginitiea wyomingensis* (Knowlton et Cockerell) Manchester.
Comment: The author stated that this fossil is similar to feeding damage by the extant genus *Paraclemensia*.

—Labandeira, 2002a: 46, figs. 4h–i (aff. *Incurvaria*).
CI and T (leaf mine)/TBMM (1 ex: no. 71371)/USA: Washington State, Ferry Co., Republic (Klondike Mountain Fm.)/early Lutetian, Middle Eocene.
Fossil plant host: Cornaceae —*Aucuba* sp.

—Labandeira, 2002a: 46 (probably incurvariid damage).
= holes made by a fungus; Schaarschmidt, 1992: fig. 34.
CI and T (leaf mine)/not stated/Germany: Hesse, S Frankfurt, near Darmstadt, Messel oil shale-layers (Messel Fm.)/early Lutetian, Middle Eocene.
Fossil plant host: Lauraceae —*Laurophyllum*.

—Skalski, 1979c: 63 (Incurvariidae).
AM (adult: whole body)/not stated/Russia: Siberia, E Taimyr, Taimyr Autonomous Okrug, Chatanga (Taimyr Amber, Kheta Fm.)/Coniacian, Late Cretaceous.

Questionably placed in Incurvariidae

INCURVARITES Rebel, 1934a: 14 (Incurvariidae); Skalski, 1976b: 200 (?Incurvariidae).
Type species: *Incurvarites alienella* Rebel, 1934.
= *Incurvariites* [sic]; Whalley, 1986: 260 [in figure legend].

alienellus Rebel, 1934a: 14, fig. 6 (*Incurvarites*).
= "*Incurvarites*"; Rebel, 1934b: 373 [no description].
AM (adult: whole body)/BPGM (HT: L-10)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

GENUS *incertae sedis*

—Whalley, 1978: 77, pl. 13: 3–4 (Incurvariidae); Kozlov, 1988: 54 (uncertain).
AM (adult: wing scales)/BMNH/Lebanon: Hammana, Mdeyrij (Lebanese Amber, Grès de Basa Fm. or lateral equivalents)/Hauterivian–Aptian, Early Cretaceous.

FAMILY *incertae sedis*

—Krassilov and Shuklina, 2008: 243, fig. 3if (incurvarioid case construction holes).
CI and T (leaf damage)/IEUH (>1 ex: IG1-739; etc.)/Israel: Negev Desert, central Negev, Makhtesh Ramon (Upper Hatira Fm.); Negev Desert, southern Negev, Arava Valley, Gerofit (Ora Fm.)/Turonian, Late Cretaceous.
Fossil plant host: Cercidiphyllaceae —*Eocercidiphyllites glandulosus* Krassilov.

Clade Etimonotrysia Minet, 1984 [extant]

Superfamily TISCHERIOIDEA Spuler, 1898 [extant]

Family TISCHERIIDAE Spuler, 1898 [extant]

Questionably placed in Tischeriidae

GENUS *incertae sedis*

—Stephenson, 1991: 166 (Mine type KLm14).
CI and T (leaf mine)/GBIU (1 ex: IU15808-7545)/USA: Tennessee, Carroll Co., Vale, Cooper Pit (Ripley Fm.)/Maastrichtian, Late Cretaceous.
Comment: The author suggested that recent analogs of these fossils are leaf mines caused by extant *Tischeria* sp.

Clade Ditrysia Börner, 1825 [extant]

Superfamily TINEOIDEA Latreille, 1810 [extant]

Family TINEIDAE Latreille, 1810 [extant]

Subfamily ACROLOPHINAE Busck, 1912 [extant]

ACROLOPHUS Poey, 1832 [extant]

—Grimaldi and Engel, 2005: fig. 13: 36 (*Acrolophus*).
AM (adult: whole body)/AMNH (1 ex)/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

GENUS *incertae sedis*

—Kristensen and Skalski, 1998: 18, 25 (Acrolophidae).
AM (unknown)/not stated/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

Subfamily DRYADAULINAE Bradley, 1966 [extant]

cf. ***DRYADAULA*** Meyrick, 1893 [extant]

—Kristensen and Skalski, 1998: 18 (cf. *Choropleca*).
AM (unknown)/not stated/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

Subfamily HIEROXESTINAE Meyrick, 1893 [extant]

cf. *OPOGONA* Zeller, 1853 [extant]

—Kristensen and Skalski, 1998: 18 (cf. *Opogona*).
AM (unknown)/not stated/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

Subfamily MEESSIINAE Capuse, 1966 [extant]

ELECTROMEESIA Kozlov, 1987: 63; Kozlov, 1988: 36 (Meessiinae).
Type species: *Electromeessia zaguljaevi* Kozlov, 1987.

zaguljaevi Kozlov, 1987: 63, fig. 2d (*Electromeessia*).
AM (adult: whole body)/PIRAS (HT: PIN 363/77)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

PALAEOINFURCITINEA Kozlov, 1987: 62; Kozlov, 1988: 36 (Meessiinae).
Type species: *Palaeoinfurcitinea rohdendorfi* Kozlov, 1987.

rohdendorfi Kozlov, 1987: 62, fig. 2c (*Palaeoinfurcitinea*).
AM (adult: whole body)/PIRAS (HT: PIN 964/661)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

PARATRIAXOMASIA Jarzembowski, 1980: 267; Kozlov, 1988: 36 (Meessiinae).
Type species: *Paratriaxomasia solentensis* Jarzembowski, 1980.

solentenis Jarzembowski, 1980: 267, fig. 53 (*Paratriaxomasia*).
CI (adult: whole body)/BMNH (HT: In.9166)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

SIMULOTENIA Skalski, 1977: 16; Kozlov, 1988: 36 (Meessiinae).
Type species: *Simulotenia intermedia* Skalski, 1977.

intermedia Skalski, 1977: 16, figs. 10–11, pl. 1: 1, pl. 2: 1 (*Simulotenia*).
AM (adult: whole body)/MEPA (HT: 49/3 G/9 no. 1535/8, 3 MZ/AWS)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

TINEOLAMIMA Rebel, 1934a: 13; Kozlov, 1988: 36 (Meessiinae).
Type species: *Tineolamima aurella* Rebel, 1934.
= *Tineolamina* [sic]; Keilbach, 1982: 314.

aurella Rebel, 1934a: 13, pl. 1: 5 (*Tineolamima*); Kusnezov, 1941: 69 (?*Tineolamima*).
= Tineidae (s. l.); Rebel, 1934b: 373 (part).
AM (adult: whole body)/originally BPGM (HT: L-1)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

EUDARCIA Clemens, 1860 [extant]

—Sobczyk and Kobbert, 2009: 18, fig. 2 (*Eudarcia*)
AM and T (larval case)/private collection, Max J. Kobbert, Münster, Germany (1 ex: T069)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Subfamily MYRMECOZELINAE Zagulajev, 1968 [extant]

MARTYNEA Kusnezov, 1941: 24; Kozlov, 1988: 36 (Myrmecozelinae).
Type species: *Martynea rebeli* Kusnezov, 1941.

rebeli Kusnezov, 1941: 27, figs. 9–10 (*Martynea*).
AM (adult: whole body)/PIRAS (HT: no. 14)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

PSEUDOCEPHITINEA Kozlov, 1987: 62; Kozlov, 1988: 36 (Myrmecozelinae).
Type species: *Pseudocephitinea svetlanae* Kozlov, 1987.

svetlanae Kozlov, 1987: 62, fig. 2b (*Pseudocephitinea*).
AM (adult: whole body)/PIRAS (HT: PIN 367/78)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Subfamily SCARDIINAE Eyer, 1924 [extant]

GLESSOSCARDIA Kusnezov, 1941: 39; Kozlov, 1988: 35 (Scardiinae).
Type species: *Glessoscardia gerasimovi* Kusnezov, 1941.

gerasimovi Kusnezov, 1941: 43, figs. 27–28 (*Glessoscardia*).
AM (larva: whole body)/PIRAS (HT: no. 16)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

PALAEOSCARDITES Kusnezov, 1941: 36; Kozlov, 1988: 35 (Scardiinae).
Type species: *Palaeoscardiites mordvilkoi* Kusnezov, 1941.

mordvilkoi Kusnezov, 1941: 37, figs. 20–24 (*Palaeoscardiites*).
AM (adult: whole body)/PIRAS (HT: no. 7)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

PROSCARDITES Kusnezov, 1941: 33; Kozlov, 1988: 35 (Scardiinae).
Type species: *Proscardiites martynovi* Kuznezov, 1941.

martynovi Kusnezov, 1941: 34, figs. 16–19 (*Proscardiites*).
AM (adult: whole body)/PIRAS (HT: no. 5)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

SCARDITES Kusnezov, 1941: 30; Kozlov, 1988: 35 (Scardiinae).
Type species: *Scardiites meyricki* Kusnezov, 1941.

meyricki Kusnezov, 1941: 32, figs. 13–15 (*Scardiites*).
AM (adult: whole body)/PIRAS (HT: no. 2)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Subfamily TINEINAE Latreille, 1810 [extant]

cf. ***CERATOPHAGA*** Petersen, 1957 [extant]

—Hill, 1987: 543, fig. B2 (cf. *Ceratophaga*).
SI and T (larval feeding damage)/not stated [private collection, Mary Leakey?] (>1 ex: LAET 75 958 7E; etc.)/Tanzania: Laetoli, Upper Laetoli Beds (Laetoli Fm.); Olduvai Gorge, site FLK (Olduvai Fm.) and Ethiopia: Omo Basin (Shungura Fm.)/?Piacenzian, Late Pliocene–Early Pleistocene boundary.
Comment: These fossils are larval feeding damage on bovid horn cores.

MONOPIBALTIA Skalski, 1974: 98; Kozlov, 1988: 35 (Tineinae).
Type species: *Monopibaltia ignitella* Skalski, 1974.

ignitella Skalski, 1974: 98, figs. 7–10 (*Monopibaltia*).
AM (adult: whole body)/IPEG (HT: LEP.SUCC.11 DEI/AWS)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

PALAEOTINEA Kozlov, 1987: 60; Kozlov, 1988: 35 (Tineinae).
Type species: *Palaeotinea rasnitsyni* Kozlov, 1987.

rasnitsyni Kozlov, 1987: 61, fig. 2a (*Palaeotinea*).
AM (adult: whole body)/private collection, K. M. Sadilenko, Moscow, Russia (HT: 2-1-9)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Subfamily TILLYARDINEINAE Kozlov, 1988: 37

DYSMASIITES Kusnezov, 1941: 28; Kozlov, 1988: 37 (Tillyardineinae).
Type species: *Dysmasiites carpenteri* Kusnezov, 1941.

carpenteri Kusnezov, 1941: 29, figs. 11–12 (*Dysmasiites*).
AM (adult: whole body)/PIRAS (HT: no. 3)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

TILLYARDINEA Kusnezov, 1941: 22; Kozlov, 1988: 37 (Tillyardineinae).
Type species: *Tillyardinea eocaenica* Kusnezov, 1941.

eocaenica Kusnezov, 1941: 23, figs. 5–8 (*Tillyardinea*).
AM (adult: whole body)/PIRAS (HT: no. 1)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

TINEOSEMOPSIS Skalski, 1974: 97 (Nemapogoninae); Kozlov, 1988: 37 (Tillyardineinae).
Type species: *Tineosemopsis decurtatus* Skalski, 1974.

decurtatus Skalski, 1974: 97, figs. 1–6 (*Tineosemopsis*).
AM (adult: whole body)/private collection, Oehlke Eberswalde, Germany (HT: LEP.SUCC.10 AWS)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

SUBFAMILY *incertae sedis*

ARCHITINEA Rebel, 1934a: 10.
Type species: *Architinea balticella* Rebel, 1834.

balticella Rebel, 1934a: 10, fig. 4 (*Architinea*).
= Tineidae (s.l.); Rebel, 1934b: 373 (part).
AM (whole body)/BPGM (HT: L-8)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

TINEITELLA Fletcher, 1940: 18, a replacement name for *Tineites*.
= *Tineites* Kawall, 1876: 171. A junior homonym of *Tineites* Germar, 1842 [Ephemeroptera].
Type species: *Tineites crystalli* Kawall, 1876.

crystalli Kawall, 1876: 171 (*Tineites*); Kozlov, 1988: 55 (?*Tineites*).
SI (larva)/not stated (6 ex)/Russia: Siberia, Central Ural Mountains, Ufalei/Cenozoic.
Comment: Kozlov (1988) doubted its association with Tineidae.

sepositellus Rebel, 1934a: 12, fig. 5 (*Architinea*); Kusnezov, 1941: 68 (?*Architinea*); Kozlov, 1988: 37 (*Tineites*); Fletcher, 1940: 18 (*Tineitella*).
= Tineidae (s.l.); Rebel, 1934b: 373 (part).
AM (adult: whole body)/BPGM (HT: L-9)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

sucinacius Kozlov, 1987: 63, fig. 3 (*Tineites*).
AM (adult: whole body)/private collection, K. M. Sadilenko, Moscow, Russia (HT: 5-2-1)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Handschin, 1944: 8, pl. 3: 7–10, 13 (Tineidarum gen. indet.); Kozlov, 1988: 38 (*Tineites*) [multiple species?].
SI (larva and pupa)/NHMB/France: Lot Prov., Quercy (Phosphorites Fm.)/Rupelian, Early Oligocene.

GENUS *incertae sedis*

—Grimaldi and Engel, 2005: 575, fig. 13: 35 (Tineidae).
AM and T (larval case)/AMNH (1 ex: DR11-14)/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

—Grimaldi and Nascimbene, 2010: 180 (Tineidae) [multiple species].
AM (adult: whole body)/?AMNH/USA: New Jersey, Middlesex Co., Sayreville (New Jersey Amber, Raritan Fm.)/Turonian, Late Cretaceous.
Comment: The authors mentioned these amber inclusions as “definitive representatives of the recent family Tineidae.”

—Jarzembowski, 1980: 269, fig. 55 (Tineidae).
CI (adult: whole body)/BMNH (1 ex: In.9614)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

—Kupryjanowicz, 2001: 62, fig. 81 (Tineidae).
AM (adult: whole body)/MEPA (1 ex: no. 16212)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.
Comment: The author stated that this record was based on an identification by Skalski.

—Menge, 1856: 28–29 (Tineidae) [multiple species].
AM (adult and larva)/not stated (67 ex: [lost?])/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Menge, 1856: 28–29 (Tineidae) [multiple species].
AM and T (larval case)/not stated (2 ex: [lost?])/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Poinar, 1992: 162, 282 (Tineidae).
AM (not stated)/?UCMP/Mexico: Chiapas, Simojovel (Mexican Amber, Simojovel Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

—Poinar *et al.*, 1991: 210, figs. 1–2 (Tineidae).
AM (adult: whole body)/AIOSU (1 ex: S-1-23)/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

—Rosenkjaer, 1906: 96, 107, 115, 120, 132 (Møl-coconer [= moth cocoon]); Henriksen, 1933: 214 (Tineidae spp.).
SR (cocoon)/not stated/Denmark: Jutland, Grundudgravninger (unconsolidated sediments)/Holocene.
Comment: These fossils may represent the larval cases. Henriksen (1933) considered them to have been made by the extant *Tinea pellionella* and/or *Tineola biselliella*.

—Skalski, 1976b: 199 (Tineidae).
AM (not stated)/not stated/Mexico: Chiapas, Simojovel (Mexican Amber, Simojovel Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

—Weitschat, 2009: 253, fig. 43 (Tineidae).
AM (larva and larval case)/DBRD/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Weitschat and Wichard, 1998: 198, pl. 79: a–c (Tineidae) [multiple species].
AM (larva and larval case)/RMOD (> 3 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Questionably placed in Tineidae

GENUS *incertae sedis*

—Skalski, 1973a: 157, fig. 3, pl. 36 (?Tineidae)
AM (adult: whole body)/PLUW (HT: no. 174, 9 IGUW/AWS)/Lithuania: Klaipedos, Palanga (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Family PSYCHIDAE Boisduval, 1829 [extant]

Subfamily OIKETICINAE Herrich-Schäffer, 1855 [extant]

—Sobczyk and Kobbert, 2009: 18, figs. 3, 5 (Oiketicinae) [multiple species].
AM and T (larval case)/private collection, Max J. Kobbert, Münster, Germany (2 ex: T279; T609)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Sobczyk and Kobbert, 2009: 18, fig. 4 (Oiketicinae).
AM (larval case with larva)/private collection, Max J. Kobbert, Münster, Germany (1 ex: T314)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Subfamily PSYCHINAE Boisduval, 1829 [extant]

PROUTIA Tutt, 1899 [extant]

—Sobczyk and Kobbert, 2009: 18, fig. 6 (*Proutia*).
AM and T (larval case)/private collection, Max J. Kobbert, Münster, Germany (1 ex: T338)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Subfamily EPICHNOPTERIGINAE Tutt, 1900 [extant]

REBELIA Heylaerts, 1900 [extant]

—Sobczyk and Kobbert, 2009: 13 [in abstract], 16 (*Rebelia*).
AM and T (larval case)/not stated/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Subfamily NARYCIINAE Tutt, 1900 [extant]

DAHLICA Enderlein, 1912 [extant]

triquetrella Hübner, 1813 (*Tinea*) [extant]; Sobczyk and Kobbert, 2009: 17, 19, figs. 9, 10 [fossil].
AM and T (larval case)/private collection, Max J. Kobbert, Münster, Germany (2 ex: T663; T729)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Subfamily TYPHONIINAE Lederer, 1853 [extant]

GENUS *incertae sedis*

—Sobczyk and Kobbert, 2009: 19, figs. 7, 8 (Typhoniinae).
AM and T (larval case)/private collection, Max J. Kobbert, Münster, Germany (1 ex: T338)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

SUBFAMILY *incertae sedis*

ADELOPSYCHE Cockerell, 1926: 17 (Cossidae); Kozlov, 1988: 34 (Psychidae).
Type species: *Adelopsyche frustrans* Cockerell, 1926.

frustrans Cockerell, 1926: 18, fig. 1 (*Adelopsyche*).
CI (adult: whole body)/UCNH (HT)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.

PSYCHITES Kozlov, 1988: 34.
Type species: not designated.

pineellus Heer, 1849: 184 (*Psyche*); Kozlov, 1988: 34 (*Psychites*).
= *Psyche pincella* [sic]; Giebel, 1856: 189.
= *Psyche pioneela* [sic]; Scudder, 1891: 679.
CI and T (larval case)/private collection, "Herrn [Mr.] Lavater" [lost or now possibly in PMUZ]/Switzerland: Neuchâtel Canton, Oeningen ("Molasseformatien")/Messinian, Late Miocene.

pristinellus Rebel, 1934a: 10, pl. 1: 4 (?*Sterrhopteryx*); Kozlov, 1988: 34 (*Psychites*); Sobczyk and Kobbert, 2009: 18, fig. 1 ("*Sterrhopteryx*").
= "Psychiden-Sädke"; Rebel, 1934b: 373.

AM (larva and larval case)/BPGM (HT: H-8); private collection, Max J. Kobbert, Münster, Germany (1 ex: T144)/ Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Kozlov, 1988: 34, fig. 6 (*Psychites*).
AM and T (larval case)/PIRAS (1 ex: PIN 363/79)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

BALTOPSYCHE Sohn, **gen. nov.** A replacement name for *Palaeopsyche* Sobczyk and Kobbert, 2009.
= *PALAEOPSYCHE* Sobczyk and Kobbert, 2009: 17. A junior homonym of *Palaeopsyche* Perkins, 1905 [Lepidoptera: Epipyropidae].
Type species: *Palaeopsyche secundum* Sobczyk and Kobbert, 2009.

secundum Sobczyk and Kobbert, 2009: 17, fig. 11 (*Palaeopsyche*). **comb. nov.**
AM and T (larval case)/private collection, Max J. Kobbert, Münster, Germany (HT: T666; PT: T349; T618; T557); private collection, Thomas Sobczyk, Hoyerswerda, Germany (PT: ST15)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

transversum Sobczyk and Kobbert, 2009: 20, fig. 12 (*Palaeopsyche*). **comb. nov.**
AM and T (larval case)/private collection, Max J. Kobbert, Münster, Germany (HT: T316; PT: T710); private collection, Thomas Sobczyk, Hoyerswerda, Germany (PT: 021TS)/Baltic Region (Baltic Amber, Prussian Fm.)/ Lutetian, Middle Eocene.

GENUS *incertae sedis*

—Bachofen-Echt, 1949: 147, fig 133–137 (Psychidae) [multiple species].
= Tineidae (s. l.); Rebel, 1934b: 373 (part)
AM and T (larva and larval case)/BPGM (> 1 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Menge, 1856: 27–28 (Psychidae, 7 species).
AM and T (larval case)/not stated (15 ex: [lost?])/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Nuorteva and Kinnunen, 2008: 117, fig. 9 (Psychidae).
AM and T (larval case)/FMUH (1 ex: no. 5640)/Lithuania: Klaipedos, Palanga (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Perkovsky *et al.*, 2003: 427, fig. 3 (Psychidae) [multiple species].
AM and T (larva and larval case)/NASU/Ukraine: northern Rovno and Zhitomir Regions, Klesov locality (Rovno Amber, Obukhov Fm.)/Priabonian, Late Eocene.

—Sobczyk and Kobbert, 2009: 15 (Psychidae) [multiple species].
AM and T (larval case)/private collection, Max J. Kobbert, Münster, Germany (56 ex: T103; T183; T195; T197; T211; T219; T221; T231; T232; T269; T322; T339; T376; T389; T416; T430; T439; T452; T482; T491; T517; T518; T519; T529; T531; T543; T602; T603; T604; T605; T606; T608; T610; T611; T612; T648; T650; T651; T664; T667; T669; T670; T697; T703; T704; T705; T706; T707; T708; T709; T722; T723; T724; T725; T726; T727); private collection, Thomas Sobczyk, Hoyerswerda, Germany (13 ex: 004TS; 006TS; 008TS; 009TS; 014TS; 015TS; 016TS; 022TS; 023TS; 024TS; 026TS; 027TS; 041TS)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Weitschat, 2009: 253, figs. 41, 44 (Psychidae) [multiple species].
AM and T (larval case)/DBRD/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Weitschat and Wichard, 1998: 198, pl. 79: f–h (Psychidae) [multiple species].
AM and T (larva or larval case)/RMOD (> 3 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Questionably placed in Psychidae

—Lewis, 1976: 345, fig. 1a (Psychidae).
CI and T (feeding mark)/CSUM/USA: SW Montana, Madison County, Ruby River Basin between Peterson and Mormon Creeks (Renova Fm.)/Chattian, Late Oligocene.
Fossil plant host: Fagaceae —*Quercus convexa* Lesq. [extant].

FAMILY *incertae sedis*

GENUS *incertae sedis*

—Hurd *et al.*, 1962: 110 (Tineoidea).
AM (adult: whole body)/?UCMP/Mexico: Chiapas, Simojovel (Mexican Amber, Simojovel Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

—Perkovsky *et al.*, 2003: 427 (Tineoidea) [multiple species].
AM (adult: whole body)/NASU/Ukraine: northern Rovno and Zhitomir Regions, Klesov locality (Rovno Amber, Obukhov Fm.)/Priabonian, Late Eocene.

Superfamily GRACILLARIOIDEA Stainton, 1854 [extant]

Family BUCCULATRICIDAE Fracker, 1915 [extant]

BUCCULATRIX Zeller, 1839 [extant]

platani Kozlov, 1988: 39, pl. 2: 6 (*Bucculatrix*).
CI and T (leaf mine)/PIRAS (HT: PIN 2383/213)/Kazakhstan: Kzyl-Ordinsky Region, Chilinsky, northwest spur of Karatau mountain range, Kzyl-Dzhar (Beleuty Fm.)/Turonian, Late Cretaceous.
Fossil plant host: Platanaceae —*Platanus cuneifolia* Bronn.

thoracella Thunberg, 1794 (*Tinea*) [extant]; Straus, 1977: 58, fig. 61 [fossil].
CI and T (leaf mine)/GPUG (1 ex: no. 18422)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).
Fossil plant host: Malvaceae —*Tilia* sp.
Comment: Straus (1977) suggested that this mine is identical to leaf mines on *Tilia* made by the extant species *Bucculatrix thoracella*.

—Opler, 1973: 1321, fig. 1c (*Bucculatrix*).
CI and T (leaf mine)/UCMP/USA: Nevada, Buffalo Canyon (Buffalo Canyon Fm.)/Langhian, Middle Miocene.
Fossil plant host: Fagaceae —*Quercus hanibalii* Dorf.

—Opler, 1982: 145 (*Bucculatrix*).
CI and T (leaf mine)/not stated [?UCMP]/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.
Fossil plant host: Fagaceae —*Quercus drymeja* Unger [reported as "*Zelkova*" *drymeja* by Opler (1982)]

Family GRACILLARIIDAE Stainton, 1854 [extant]

Subfamily PHYLLOCNISTINAE Herrich-Schäffer, 1857 [extant]

cf. *PHYLLOCNISTIS* Zeller, 1848 [extant]

cf. *liriodendronella* Clemens, 1863 (*Phyllocnistis*) [extant]; Chambers, 1882: 529 [fossil].
= tineid or tortricid leaf mines; Hagen, 1882: 265.
CI and T (leaf mine)/MCZH/USA: central Kansas (Dakota Fm.)/late Albian, Early Cretaceous.
Fossil plant host: ?Magnoliaceae.

cf. *liquidambarisella* Chambers, 1875 (*Phyllocnistis*) [extant]; Chambers, 1882: 529 [fossil].
= tineid or tortricid leaf mines; Hagen, 1882: 265.
CI and T (leaf mine)/MCZH/USA: central Kansas (Dakota Fm.)/late Albian, Early Cretaceous.
Fossil plant host: ?Altingiaceae.
Comment: Chambers (1882) linked this fossil with the extant species solely by the host association.

—Jarzembowski, 1995: 146 (*Phyllocnistis*).
CI and T (leaf mine)/BMNH/United Kingdom: Hampshire, East Dorset, Bournemouth (Branksome Sand Fm.)/ Lutetian, Middle Eocene (McElwaine, 1998).

—Knowlton, 1917: 80, pl. 33: 5 (*Phyllocnistis*).
CI and T (leaf mine)/USNM [not found in an inventory by J.-C. Sohn at USNM]/USA: Wyoming, Lincoln County, Cumberland (Frontier Fm.)/Turonian, Late Cretaceous.
Fossil plant host: ?Staphyleaceae —?*Staphylea fremonti* Knowlt.
Comment: This record was based on identification by Busck.

—Labandeira, 2002a: 47, figs. 4c–d (phyllocnistine).
CI and T (leaf mine)/TBMM (1 ex: no. 94055a)/Canada: British Columbia, McAbee/Lutetian, Middle Eocene.

—Labandeira *et al.*, 1994: 12279, figs. 1i–l (*Phyllocnistis*).
CI and T (leaf mine)/FMUF (2 ex: UF4818; UF15709-7351)/USA: Kansas, Cloud Co., Braun's Ranch (Dakota Fm.)/Albian–Cenomanian, Late Cretaceous.
Fossil plant host: Chloranthaceae —*Densinervum* sp. and *Crassidenticulum decurrens* Upchurch and Dilcher; Lauraceae —*Pabiana variloba* Upchurch and Dilcher.
Comment: Kristensen and Skalski (1998: 16) regard these mines as "the earliest convincing evidence for the existence of the Ditrysia."; also see Davis (1994).

—Stephenson, 1991: 168 (*Phyllocnistis*); Stephenson and Scott, 1992: 547, fig. 5: a; Lang *et al.*, 1995: 158, fig. 3c, pl. 2: 1.
CI and T (leaf mine)/BMNH (1 ex: V.50974)/United Kingdom: Hampshire, East Dorset, Bournemouth (Branksome Sand Fm.)/Lutetian, Middle Eocene (McElwaine, 1998).
Comment: The authors used similarity to recent leaf mines to characterize this fossil. It is not clear that they intended to link the fossil taxonomically with extant species (see Lang *et al.* 1995 for the analog).

Subfamily GRACILLARIINAE Stainton, 1854 [extant]

cf. *ACROCERCOPS* Wallengren, 1881 [extant]

—Opler, 1973: 1321 (cf. *Acrocercops*).
CI and T (leaf mine)/UCMP/USA: Oregon, Harney Co. (Trout Creek Fm.)/Serravallian, Middle Miocene.
Fossil plant host: Fagaceae —*Quercus consimilis* Newb.

cf. *CALOPTILIA* Hübner, 1825 [extant]

cf. *alchimiella* Scopoli, 1763 (*Palaena*) [extant]; Straus, 1977: 58 [fossil].
CI and T (leaf mine)/GPUG (1 ex: no. 22788)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene.
Fossil plant host: Fagaceae —*Fagus* cf. *orientalis* Lipsky.
Comment: Straus (1977) associated this fossil with the leaf mine made by the extant *Caloptilia alchimiella*.

cf. *roscipennella* Hübner, 1796 (*Tinea*) [extant]; Straus, 1977: 58, fig. 76 [fossil]; Givulescu, 1984: 6, pl. 3: 4 [fossil].
CI and T (leaf mine)/GPUG (1 ex: no. 22440); IGGB (1 ex: no. P.25789)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene.
Fossil plant host: Betulaceae; Juglandaceae —*Juglans* sp.
Comment: Straus' (1977) identification was based on similarity to the extant species in leaf mine shape and host association. Givulescu (1984) reported a leaf mine fossil which he considered to be same as cf. *Caloptilia roscipennella*, identified by Straus (1977).

cf. *sassafrasella* Chambers, 1876 (*Gracilaria*) [extant]; Chambers, 1882: 529 [fossil].
= tineid or tortricid leaf mines; Hagen, 1882: 265.
CI and T (leaf mine)/MCZH/USA: central Kansas (Dakota Fm.)/late Albian, Early Cretaceous.
Fossil plant host: Lauraceae —"*Sassafras*" *cretaceum* Newbe.
Comment: Chambers (1882) linked this fossil with the extant species solely by host association.

—Lewis, 1969: 1210 (Nepticulidae); Opler, 1973: 1322 (*Caloptilia*).
CI and T (leaf mine)/CSUM/USA: E Washington State, Spokane, Brickyard (Latah Fm.)/Serravalian, Middle Miocene.
Fossil plant host: ?Fagaceae —?*Quercus*.

—Straus, 1977: 58, fig. 60 (*Coriscium* [a synonym of *Caloptilia*]).
CI and T (leaf mine)/GPUG (1 ex: no. 30838)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).
Fossil plant host: Magnoliaceae —*Magnolia*; or Oleaceae —*Syringa*.
Comment: The author's identification was based on similarity to the extant fauna in leaf mine shape.

GRACILLARIITES Kozlov, 1987: 67.
Type species: not designated.

lithuanicus Kozlov, 1987: 68, fig. 5a (*Gracillariites*).
AM (adult: whole body)/PAML (HT: Ap-9983)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

mixtus Kozlov, 1987: 68, figs. 5b, 5c (*Gracillariites*).
AM (adult: whole body)/private collection, K. M. Sadilenko, Moscow, Russia (HT: 6-1-1)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Jarzembowski, 1980: 274, fig. 64 (uncertain, species H); Kozlov, 1988: 40 (*Gracillariites*).
CI (adult: partial body and wings)/BMNH (1 ex: I.8809)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

cf. *PARORNIX* Spuler, 1910 [extant]

—Straus, 1977: 59, fig. 49 (cf. *Parornix*).
CI and T (leaf mine)/GPUG (1 ex: no. 15876/a)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).
Fossil plant host: Rosaceae —*Amelanchier* sp.
Comment: The author's identification was based on similarity to extant species in leaf mine shape and host association.

Subfamily LITHOCOLLETINAE Stainton, 1854 [extant]

cf. *CAMERARIA* Chapman, 1902 [extant]

cf. *aceriella* Clemens, 1859 (*Lithocolletis*) [extant]; Chambers, 1882: 529 [fossil].
= tineid or tortricid leaf mines; Hagen, 1882: 265.
CI and T (leaf mine)/MCZH/USA: central Kansas (Dakota Fm.)/late Albian, Early Cretaceous.
Fossil plant host: Sapindaceae —*Acer* sp.
Comment: Chambers (1882) linked this fossil with the extant species solely on the basis of host association.

—Opler, 1973: 1321 (cf. *Cameraria*).
CI and T (leaf mine)/UCMP/USA: Idaho, Thorn Creek (Payette Fm.)/Tortonian, Late Miocene.
Fossil plant host: Fagaceae —*Quercus simulata* Knowlt and ?*Lithocarpus* sp.

cf. *PHYLLONORYCTER* Hübner, 1822 [extant]

maestingella Müller, 1764 (*Phalaena Tinea*) [extant]; Straus, 1977: 59, fig. 59 (*Lithocolletis*) [fossil].
CI and T (leaf mine)/GPUG (2 ex: no. 30057; no. 15026)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).
Fossil plant host: Fagaceae —*Fagus* sp.
Comment: Straus (1977) assigned these fossil mines to the extant species *Phyllonorycter maestingella*, based on similarity in leaf mine shape and host association.

oliveirae Martins-Neto, 1989: 381, pl. 1: d (*Phyllonorycter*).
CI and T (leaf mine)/IGUSP (HT: GP/1T-1645)/Brazil: São Paulo, Taubaté, Estiva District, Argila Vírgllio, Mineraçáo Company (Tremembé Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.
Fossil plant host: Symplocaceae —*Symplocos* sp.

—Freeman, 1965: 1069, fig. 1 (*Lithocolletis*).
CI and T (leaf mine)/GSCBO/Canada: British Columbia, White Lake Basin/Priabonian, Late Eocene.

—Krassilov and Shuklina, 2008: 243, fig. 3i (lithocolletiform mines).
CI and T (leaf mine)/IEUH (>1 ex: IG1-644; etc.)/Israel: Negev Desert, central Negev, Makhtesh Ramon (Upper Hatira Fm.); Negev Desert, southern Negev, Arava Valley, Gerofit (Ora Fm.)/Turonian, Late Cretaceous.
Fossil plant host: Myrtales —*Dewalquea gerofitica* (Dobruskina) Krassilov.

—Lewis, 1985: 257, fig. 21 (?*Lithocolletis*).
CI and T (leaf mine)/UIMM (1 ex: T-0069)/USA: northern Idaho, Clarkia locality P-33 (Latah Fm.)/Serravalian, Middle Miocene.
Fossil plant host: Fagaceae —*Quercus* sp.

—Opler, 1973: 1321, fig. 1d (*Lithocolletis*).
CI and T (leaf mine)/UCMP/USA: Nevada, Nye Co., Cedar Mountains, Upper Goldyke (Esmeralda Fm.)/Serravallian, Middle Miocene.
Fossil plant host: Fagaceae —*Quercus hanibalii* Dorf.

—Opler, 1973: 1321 (*Lithocolletis*).
CI and T (leaf mine)/UMCP/USA: Nevada, SW Mineral County, Hawthorn, Stewart Valley Fossil Beds (Savage Canyon Fm.)/Serravalian, Middle Miocene (Perkins *et al.* 1998).
Fossil plant host: Salicaceae —*Populus trichocarpa* var. *ingrata* (Jeps.) Parish.

—Stephenson, 1991: 171 (Mine Type TLm5); Lang *et al.*, 1995: 155, fig. 2b, pl. 1: 1–2 (?*Lithocolletis*).
CI and T (leaf mine)/BMNH (1 ex: V.49146)/United Kingdom: Hampshire, East Dorset, Bournemouth (Branksome Sand Fm.)/Lutetian, Middle Eocene (McElwaine, 1998).
Comment: The authors used similarity to various recent leaf mines to characterize this fossil. It is not clear that they intended to link the fossil taxonomically with extant species (see Lang *et al.* 1995 for the modern analog cited).

SUBFAMILY *incertae sedis*

GENUS *incertae sedis*

—Labandeira *et al.*, 2002a: 315, fig. 12 (a gracillariid leaf mine).
CI and T (leaf mine)/DMNH (6 ex: no. 7199; no. 7263; no. 7313; no. 7325; no. 7498; no. 20023)/USA: SW North Dakota, Williston Basin (Hell Creek Fm.)/latest Maastrichtian, Late Cretaceous.
Fossil plant host: Laurales (cf. Lauraceae) —*Marmarthia pearsonii* Johnson.

—Poinar and Brown, 2002: 131, fig. 12 (Gracillariidae).
AM and T (leaf mine)/AIOSU (1 ex; Sd-9-125)/Mexico: Chiapas, Simojovel (Mexican Amber, Simojovel Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.
Fossil plant host: Fabaceae —*Hymenaea mexicana* Poinar and Brown.

—Poinar *et al.*, 1991: 210, figs. 3–5 (Gracillariidae).
AM (adult: whole body)/AIOSU (1 ex: S-1-24)/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

—Ross *et al.*, 2010: 234 (Gracillariidae).
AM (not stated)/not stated/Myanmar: Kachin Prov., Hukawang Valley (Burmese Amber, "channel facies" of an unnamed formation)/late Aptian, Early Cretaceous.

Questionably placed in Gracillariidae

—Hickey and Hodges, 1975: 718–719, fig. 2a (?*Phyllocnistis*); Kozlov, 1988: 55 (uncertain).
CI and T (leaf mine)/USNM (1 ex: 208538)/USA: Wyoming, Sheridan Pass area southwest of Dubois (Wind River Fm.)/late Ypresian, Early Eocene.
Fossil plant host: Meliaceae —*Cedrela* sp.

—Wilf *et al.*, 2005: 8945, fig. 1 (?gracillariid mines).
CI and T (leaf mine)/MPEF (1 ex: Pb 983)/Argentina: Patagonia, Chubut, Laguna del Hunco (Tufolitas Laguna del Hunco)/Ypresian, Early Eocene (Genise and Petrulevicius, 2001).
Fossil plant host: Sapindaceae —"*Cupania*" *grosse-serrata* (Engelh.) Berry.

Superfamily YPONOMEUTOIDEA Stephens, 1829 [extant]

Family ARGYRESTHIIDAE Bruand, 1850 [extant]

Questionably placed in Argyresthiidae

ARGYRESTHITES Rebel, 1934a (Argyresthiidae): 5; Skalski, 1976b: 201 (?Argyresthiidae); Keilbach, 1982: 314 (?Yponomeutidae); Kozlov, 1988: 53 (uncertain).
Type species: *Argyresthites succinella* Rebel, 1934.

balticellus Rebel, 1936: 175, fig. 8 (*Argyresthites*); Skalski, 1976b: 201 (?*Argyresthites*).
AM (adult: whole body)/MNHU (HT: [not found in an inventory by J.-C. Sohn at MNHU])/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

succinellus Rebel, 1934a: 5, fig. 2 (*Argyresthites*).
= Hyponomeutidae; Rebel, 1934b: 373.
AM (adult: whole body)/BPGM (HT: L-2)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Family PRAYDIDAE Moriuti, 1977 [extant]

Questionably placed in Praydidae

cf. *PRAYS* Hübner, 1826 [extant]

—Lang *et al.*, 1995: 154–155, fig. 2a, pl. 1: 7 (cf. *Prays*).
CI and T (leaf mine)/BMNH (1 ex: V.50937)/United Kingdom: Hampshire, East Dorset, Bournemouth (Branksome Sand Fm.)/Lutetian, Middle Eocene (McElwaine, 1998).
Comment: The authors used similarity to recent leaf mines to characterize this fossil. It is not clear they intended to link the fossil taxonomically with extant species (see Lang *et al.* 1995 for the putative modern analog).

GENUS *incertae sedis*

—Stephenson, 1991: 159 (Mine Type KLm4b).
CI and T (leaf mine)/GBIU (1 ex: IU15706-4609)/USA: Kansas and Nebraska, Braun Ranch, Hoisington and other localities [not specified] (Dakota Fm.)/late Albian, Early Cretaceous.
Comment: The author suggested that the fossil is similar to leaf mines made by *Prays oleae* larvae.

Family YPONOMEUTIDAE Stephens, 1829 [extant]

Questionably placed in Yponomeutidae

GENUS *incertae sedis*

—Skalski, 1976c: 228, fig. 22 (Yponomeutidae).
CO (adult: whole body)/not stated/Tanzania: Zanzibar Island (East African Copal, unconsolidated sediments)/Late Pleistocene.

Family PLUTELLIDAE Guenée, 1845 [extant]

PLUTELLITES Kozlov, 1988: 38.
Type species: not designated.

acutipenellus Rebel, 1936: 174, fig. 6 (*Epinomeuta*); Kusnezov, 1941: 68 (?*Epinomeuta*); Kozlov, 1988: 38 (*Plutellites*).
AM (adult: whole body)/MNHU (HT: MB-N.5 [not found in an inventory by J.-C. Sohn at MNHU])/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

inversellus Rebel, 1936: 173, fig. 5 (*Epinomeuta*); Kusnezov, 1941: 68 (?*Epinomeuta*); Kozlov, 1988: 38 (*Plutellites*).
= *Epinomeuta universella* [sic]; Skalski, 1976b: 201.
AM (adult: whole body)/MNHU (HT: MB-L6)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

minorellus Rebel, 1936: 174, fig. 7 (*Epinomeuta*); Kusnezov, 1941: 68 (?*Epinomeuta*); Kozlov, 1988: 38 (*Plutellites*).
AM (adult: whole body)/MNHU (HT: MB-L8)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

tenebricus Kozlov, 1988: 39, fig. 7 (*Plutellites*).
AM (adult: whole body)/PIRAS (HT: PIN 363/80)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—MacKay, 1969: 1173, figs. 1, 2, 5a (?Plutellidae); Kozlov, 1988: 38 (*Plutellites*).
AM (larva: whole body)/ZMCD (1 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—MacKay, 1969: 1178, figs. 4, 5c (?Plutellidae); Kozlov, 1988: 38 (*Plutellites*).
AM (1st instar larva: whole body)/ZMCD (1 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Questionably placed in Plutellidae

EPINOMEUTA Rebel, 1936: 172 (Yponomeutidae); Kozlov, 1988: 38 (Plutellidae); Carpenter, 1992: 380 (?Tineidae).
Type species: *Epinomeuta truncatipennella* Rebel, 1936.

truncatipennella Rebel, 1936: 172, fig. 4 (*Epinomeuta*).
AM (adult: whole body)/MNHU (HT: MB-L7)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

SCYTHROPITES Rebel, 1936: 169 (Yponomeutidae); Keilbach, 1982: 315 (Scythriidae [sic?]); Kozlov, 1988: 39 (Plutellidae).
Type species: *Scythropites balticella* Rebel, 1936.

balticellus Rebel, 1936: 169, fig. 3 (*Scythropites*).
AM (adult: whole body)/GPUT (HT: n 3B 660)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

GENUS *incertae sedis*

—Jarzembowski, 1980: 275, fig. 58 (species K).
CI (adult: partial body and wings)/BMNH (1 ex: In.25219)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

—Skalski, 1976b: 201 (?Plutellidae).
AM (not stated)/not stated/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Skalski, 1977: 20, pl. 8: 1, 2 (inclusion 2).
AM (adult: whole body)/MEPA (1 ex: G/19 No. 1927/45, 6 MZ/AWS)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Family HELIODINIDAE Heinemann and Wocke, 1876 [extant]

Questionably placed in Heliodinidae

GENUS *incertae sedis*

—Skalski, 1990c: 164 [in table] (Heliodinidae).
AM (not stated)/not stated/Italy: Sicily, a beach on the Simeto River (Sicilian Amber)/Rupelian, Early Oligocene (Skalski and Veggiani, 1990).

Family LYONETIIDAE Stainton, 1854 [extant]
= Prolyonetiidae Kusnezov, 1941: 45

Subfamily CEMIOSTOMINAE Spuler, 1898 [extant]

PROLYONETIA Kusnezov, 1941: 43 (Lyonetiidae); Kozlov, 1988: 39 (Leucopterinae [= Cemiostominae]).
Type species: *Prolyonetia cockerelli* Kusnezov, 1941.

cockerelli Kusnezov, 1941: 45, figs. 30–32 (*Prolyonetia*).
= *Prolyonetia zeckerelli* [sic]; Larsson, 1978: 122.
AM (adult: whole body)/PIRAS (HT: no. 12)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.
Comment: The author likened this fossil to the extant *Bucculatrix* and *Oenophila*, both no longer placed in Lyonetiidae.

Questionably placed in Lyonetiidae

cf. *LYONETIA* Hübner, 1825 [extant]
—Stephenson, 1991: 170 (Mine Type TLm4); Lang *et al.*, 1995: 152, fig. 1e, pl. 1: 3, 5.
CI and T (leaf mine)/BMNH (1 ex: V.48272)/United Kingdom: Hampshire, East Dorset, Bournemouth (Branksome Sand Fm.)/Lutetian, Middle Eocene (McElwaine, 1998).
Comment: Stephenson (1991) pointed to *Incurvaria pectinea* Haworth as a recent analog of this leaf mine fossil. Lang *et al.* (1995) noted *Lyonetia prunifoliella* Hübner as a candidate recent analog.

GENUS *incertae sedis*

—Jarzembowski, 1980: 271, fig. 57 (species C).
CI (adult: whole body)/BMNH (2 ex: In.25512/25252; In.17142)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.
Comment: Jarzembowski (1980) noted its resemblance to the extant *Leucoptera* and *Bedellia*. The latter is no longer considered a lyonetiid.

—Opler, 1973: 1322 (Lyonetiidae).
CI (cocoon)/UCMP/western North America (no specific locality)/Middle Cenozoic (no specific age).

—Rebel, 1934a: 16 (Coleophoridae); Larson, 1978: 123 (?Coleophoridae); Keilbach, 1982: 314 (Lyonetiidae).
AM and T (larval case)/BPGM (no. 173 [not found in an inventory by J.-C. Sohn at BPGM])/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Clade Apoditrysia Minet, 1983

Superfamily GELECHIOIDEA Stainton, 1854 [extant]

Family AUTOSTICHIDAE Le Marchand, 1947 [extant]

Subfamily SYMMOCINAE Gozmany, 1957 [extant]

MICROSYMMOCITES Skalski, 1977: 18.
Type species: *Microsymmocites kuznetzovi* Skalski, 1977.
= *Microsymmocytes* [sic]; Keilbach, 1982: 316.

kuznetzovi Skalski, 1977: 19, figs. 16–17, pl. 6: 1, pl. 7: 1 (*Microsymmocites*).
AM (adult: whole body)/MEPA (HT: 114/34 G/44 No. 2015/1, 2 MZ/AWS)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Questionably placed in Autostichidae

SYMMOCITES Kusnezov, 1941: 54 (Gelechiidae); Carpenter, 1992: 380 (uncertain).
Type species: *Symmocites rohdendorfi* Kusnezov, 1941.
= *Symmocytes* [sic]; Keilbach, 1982: 316.

rohdendorfi Kusnezov, 1941: 56, figs. 39–44 (*Symmocites*).
AM (adult: whole body)/PIRAS (SY: no. 9; no. 13)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

OEGOCONIITES Kusnezov, 1941: 51 (Gelechiidae); Skalski, 1976b: 203 (Oecophoridae); Kozlov, 1988: 42 (Xyloryctidae); Poinar, 1992: 162–163 (Symmocidae).
Type species: *Oegoconiites borisjaki* Kusnezov, 1941.

borisjaki Kusnezov, 1941: 53, figs. 37–38 (*Oegoconiites*).
AM (adult: whole body)/PIRAS (HT: no. 4)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Family COLEOPHORIDAE Bruand, 1850 [extant]

Subfamily COLEOPHORINAE Bruand, 1850 [extant]

cf. *COLEOPHORA* Hübner, 1822 [extant]

—Givulescu, 1984: 131 (cf. ?*Coleophora* sp.).
CI and T (leaf mine)/not stated [?IGGB]/Romania: Maramures Co., Chiuzbaia, "F" site/Late Miocene.

—Krassilov, 2007: 17, fig. 2 (feeding damage typical of coleophorid miners).
CI and T (leaf mine)/IEUH (> 1 ex: IG1-847; etc.)/Israel: Negev Desert, central Negev, Makhtesh Ramon (Upper Hatira Fm.); Negev Desert, southern Negev, Arava Valley (Ora Fm.)/Albian–Turonian, Late Cretaceous.
Fossil plant host: Myrtales —*Dewalquea gerofitica* (Dobruskina) Krassilov.

—Labandeira, 2002a: 47, figs. 6e–f (cf. *Coleophora*).
CI and T (leaf mine)/TBMM (1 ex: no. 77608)/USA: Washington State, Ferry Co., Republic (Klondike Mountain Fm.)/Lutetian, Middle Eocene.

—Straus, 1977: 58, fig. 56 (cf. *Coleophora*) [multiple species].
CI and T (leaf mine)/GPUG (7 ex: no. 21040; no. 21695/a; no. 22549/a; no. 22858; no. 22907; no. 22996/a; no. 30809)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene.
Fossil plant host: Tiliaceae —*Tilia* sp.
Comment: The author tentatively identified these as the leaf mines made by various species of *Coleophora*.

Family COSMOPTERIGIDAE Heinemann and Wocke, [1876] [extant]

Subfamily CHRYSOPELEIINAE Mosher, 1916 [extant]

Questionably placed in Chrysopeleiinae

—Skalski, 1976b: 199 (?Walshiidae [= Chrysopeleiinae]).
AM (not stated)/not stated/Mexico: Chiapas, Simojovel (Mexican Amber, Simojovel Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

SUBFAMILY *incertae sedis*

—Poinar, 1992: 163 (Cosmopterigidae) [multiple species].
AM (not stated)/?UCMP/Mexico: Chiapas, Simojovel (Mexican Amber, Simojovel Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

—Poinar, 1992: 163, 287 (Cosmopterigidae) [multiple species].
AM (not stated)/not stated/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

—Skalski, 1976b: 199 (Cosmopterigidae).
AM (not stated)/not stated/Mexico: Chiapas, Simojovel (Mexican Amber, Simojovel Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.
Comment: It is not clear whether or not Skalski (1976b) and Poinar (1992) were referring to the same fossil specimens.

Family BLASTOBASIIDAE Meyrick, 1894 [extant]

GENUS *incertae sedis*

—Poinar, 1992: 163, 287 (Blastobasiidae) [multiple species].
AM (not stated)/not stated/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

Family ELACHISTIDAE Bruand, 1850 [extant]

Subfamily DEPRESSARIINAE Meyrick, 1883 [extant]

DEPRESSARITES Rebel, 1936: 175.
Type species: *Depressarites levipalpella* Rebel, 1936.
= *Depressariites* [sic]; Kozlov, 1988: 44.

blastuliferellus Rebel, 1936: 177 (*Depressarites*); Skalski, 1976b: 202 (?*Depressarites*).
AM (adult: whole body)/MNHU (HT: no number; 1 ex: N 24 [both not found in an inventory by J.-C. Sohn at MNHU])/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

levipalpellus Rebel, 1936: 175, fig. 9 (*Depressarites*).
AM (adult: whole body)/GPUT (not stated)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

PALAEODEPRESSARIA Skalski, 1979b: 101.
Type species: *Palaeodepressaria hannemanni* Skalski, 1979.

hannemanni Skalski, 1979b: 101, figs. 1–5, pl. 1–2 (*Palaeodepressaria*).
AM (adult: whole body)/MNHU (HT: MB L/11=LEP.SUCC.134 MB/AWS)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Questionably placed in Depressarinae

GENUS *incertae sedis*

—Stephenson, 1991: 165 (Mine Type KLm13).
CI and T (leaf mine)/GBIU (1 ex: IU15708-1519)/USA: Kansas and Nebraska, Braun Ranch, Hoisington and other localities [unspecified] (Dakota Fm.)/late Albian, Early Cretaceous.
Comment: The author suggested as recent analogs of these fossils the leaf mines made by *Agonopterix senecionsis* larvae.

Subfamily ELACHISTINAE Bruand, 1850 [extant]

ELACHISTITES Kozlov, 1987: 64.
Type species: not designated.

inclusus Kozlov, 1987: 64, fig. 4a (*Elachistites*).
AM (adult: whole body)/private collection, K. M. Sadilenko, Moscow, Russia (HT: 4-3-3)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

sukatshevae Kozlov, 1987: 66. figs. 4b, 4c (*Elachistites*).
AM (adult: whole body)/private collection, K. M. Sadilenko, Moscow, Russia (HT: 12-5/6-6)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

MICROPERITTIA Kozlov, 1987: 66.
Type species: *Microperittia probosciphera* Kozlov, 1987.
= *Baltonides* [sic] Skalski in Kosmowska-Ceranowicz and Popiolek, 1981: 10–11. Nomen nudum [no description].
= *Baltodines* Kupryjanowicz, 2001: 62. Nomen nudum [unnecessary emendation].

probosciphera Kozlov, 1987: 66, figs. 4d, 4e (*Microperittia*).
AM (adult: whole body)/private collection, K. M. Sadilenko, Moscow, Russia (HT: 15-2-5)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Skalski, 1976b: 205, fig. 13 (Heliodinidae); Skalski, 1977: 13, fig. 7; Kozlov, 1988: 42 (Elachistidae: *Microperittia*) [multiple species]; Skalski, 1990c: 163 (Heliodinidae); Poinar, 1992: 163 (Chrysoesthiidae).
= *Baltonides* [sic] *roeselliformis* Skalski in Kosmowska-Ceranowicz and Popiolek, 1981: 10–11, fig. 10. Nomen nudum [no description].
AM (adult: whole body)/MEPA (2 ex: no. 16523; no. 18778); not stated (ca. 20 samples)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

PALAEOELACHISTA Kozlov, 1987: 67.
Type species: *Palaeoelachista traugottolseni* Kozlov, 1987.

traugottolseni Kozlov, 1987: 67, fig. 4f (*Palaeoelachista*).
AM (adult: whole body)/private collection, K. M. Sadilenko, Moscow, Russia (HT: 2-1-8)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

PRAEMENDESIA Kozlov, 1987: 67.
Type species: *Praemendesia minima* Kozlov, 1987.

minima Kozlov, 1987: 67, fig. 4g (*Praemendesia*).
AM (adult: whole body)/private collection, K. M. Sadilenko, Moscow, Russia (HT: 14-2-6)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Subfamily ETHMIINAE Busck, 1909 [extant]

Questionably placed in Ethmiinae

GENUS *incertae sedis*

—Skalski, 1976b: 199 (Ethmiidae).
AM (not stated)/not stated/Mexico: Chiapas, Simojovel (Mexican Amber, Simojovel Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

Subfamily STENOMATINAE Meyrick, 1906 [extant]

HEXERITES Cockerell, 1933: 480 (Thyrididae); Kozlov, 1988: 54 (uncertain); Skalski, 1990b: 144 (Elachistidae, Stenomatinae).
Type species: *Hexerites primalis* Cockerell, 1933.
primalis Cockerell, 1933: 480 (*Hexerites*).
CI (adult: whole body)/UCNH/USA: Colorado, Rio Blanco Co., Piceance Creek Basin (Green River Fm.)/early Lutetian, Middle Eocene.

cf. *ETHMIA* Hübner, 1819 [extant]

mortuella Scudder, 1890: 603, pl. 15: 12, 17 (*Psecadia*); Kozlov, 1988: 54 (*incertae sedis*); Meyer, 2003: 224 (*Ethmia*).
CI (adult: whole body)/MCZH (HT: no. 8460/9630)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.

Family MOMPHIDAE Herrich-Schäffer, 1857 [extant]

Questionably placed in Momphidae

cf. *ANYBIA* Stainton, 1854 [extant]; Kozlov, 1988: 53 (uncertain).

cuprella Rebel, 1934a: 9 (?*Anybia*); Kusnezov, 1941: 68 (Tineoderum gen.).
= Elachistidae; Rebel, 1934b: 373.
AM (adult: whole body)/BPGM (HT: [not found in an inventory by J.-C. Sohn at BPGM])/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

GENUS *incertae sedis*

—Stephenson, 1991: 159 (Mine type KLm4a).
CI and T (leaf mine)/GBIU (1 ex: IU15703-4424)/USA: Kansas and Nebraska, Braun Ranch, Hoisington and other localities [unspecified] (Dakota Fm.)/late Albian, Early Cretaceous.
Comment: The author suggested leaf mines of *Mompha raschkiella* larvae as a recent analog of these fossils.

Family GELECHIIDAE Stainton, 1854 [extant]

cf. *EVIPPE* Chambers, 1873 [extant]

—Opler, 1973: 1321, 1322 (cf. *Evippe*).
CI and T (leaf mine)/UCMP/USA: Nevada, Lyon Co., near Yearington (Aldritch Station Fm.)/Zanclean, Early Pliocene.
Fossil plant host: Fagaceae —*Quercus hanibalii* Dorf.

cf. *RECURVARIA* Haworth, 1828 [extant]

cf. *nanella* [Denis and Schiffermüller], 1775 (*Tinea*) [extant]; Straus, 1977: 60, fig. 51 [fossil].
CI and T (leaf mine)/GPUG (1 ex: no. 12724/a)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).
Fossil plant host: Rosaceae —*Sorbus torminalis* L. [extant].
Comment: Straus (1977) stated that "the overall shape of the mine corresponds to ones caused by the extant species *Recurvaria nanella* but also possibly represents a closely related species."

GENUS *incertae sedis*

—Poinar, 1992: 287 (Gelechiidae).
AM (not stated)/not stated/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

—Ross *et al.*, 2010: 234 (Gelechiidae).
AM (not stated)/not stated/Myanmar: Kachin Prov., Hukawang Valley (Burmese Amber, "channel facies" of an unnamed formation)/late Aptian, Early Cretaceous.

—Skalski, 1976b: 203 (Gelechiidae).
AM (not stated)/not stated/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Skalski, 1976b: 199 (Gelechiidae).
AM (not stated)/not stated/Mexico: Chiapas, Simojovel (Mexican Amber, Simojovel Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

Family OECOPHORIDAE Bruand, 1849 [extant]

Subfamily OECOPHORINAE Bruand, 1849 [extant]

BORKHAUSENITES Rebel, 1934a: 6.
Type species: *Borkhausenites bachofeni* Rebel, 1934.

bachofeni Rebel, 1934a: 6, fig. 3, pl. 1: 2 (*Borkhausenites*).
AM (adult: whole body)/BPGM (HT: L-6)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

EPIBORKHAUSENITES Skalski, 1973a: 153.
Type species: *Epiborkhausenites obscurotrimaculatus* Skalski, 1973.

obscurotrimaculatus Skalski, 1973a: 154, fig. 1, 2, pl. 33–35 (*Epiborkhausenites*).
AM (adult: whole body)/PLUW (HT: no.16, 8 IGUW/AWS)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

GLESSEUMEYRICKIA Kusnezov, 1941: 47.
Type species: *Glesseumeyrickia henrikseni* Kusnezov, 1941.

henrikseni Kusnezov, 1941: 48, figs. 33–34 (*Glesseumeyrickia*).
AM (adult: whole body)/PIRAS (HT: no. 10)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

cf. *HOFMANNOPHILA* Spuler, 1910 [extant]
= *Hophmannophila* [sic]; Skalski, 1976b: 202, 221.

—Skalski, 1976b: 202 (*Hophmannophila* [sic]).
AM (not stated)/not stated/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

NEOBORKHAUSENITES Skalski, 1977: 20.
Type species: *Borkhausenites incertella* Rebel, 1936.

incertellus Rebel, 1936: 178, fig. 10 (*Borkhausenites*)/Skalski, 1977: 20, fig. 3 (*Neoborkhausenites*).
AM (adult: whole body)/GPUT (HT: 3 B 665, No. 1388/1, 23 IGPT/AWS)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

OECOPHORINITES Kozlov, 1988: 43.
Type species: not designated.

angustipennellus Rebel, 1936: 179, fig. 11 (*Borkhausenites*); Skalski, 1976b: 202 (?*Borkhausenites*); Kozlov, 1988: 43 (*Oecophorinites*).
AM (adult: whole body)/MNHU (HT: [not found in an inventory by J.-C. Sohn at MNHU])/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

crassellus Rebel, 1936: 182, fig. 15 (*Borkhausenites*); Skalski, 1976b: 202 (?*Borkhausenites*); Kozlov, 1988: 43 (*Oecophorinites*).
AM (adult: whole body)/MNHU (HT: MB-L2)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

implicatellus Rebel, 1936: 181, fig. 13 (*Borkhausenites*); Skalski, 1976b: 202 (?*Borkhausenites*); Kozlov, 1988: 43 (*Oecophorinites*).
AM (adult: whole body)/MNHU (HT [not found in an inventory by J.-C. Sohn at MNHU])/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

incolumnellus Rebel, 1934a: 8, pl. 1: 3 (*Borkhausenites*); Skalski, 1976b: 202 (?*Borkhausenites*); Kozlov, 1988: 43 (*Oecophorinites*).
= Oecophoridae; Rebel, 1934b: 373.
AM (adult: whole body)/BPGM (HT: L-7; 1 ex: L-4)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

ingentellus Rebel, 1936: 182 (*Borkhausenites*); Skalski, 1976b: 202 (?*Borkhausenites*); Kozlov, 1988: 43 (*Oecophorinites*).
AM (adult: whole body)/MNHU (HT: MB-L3)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

innominatus Kusnezov, 1941: 50, figs. 35–36; Kozlov, 1988: 43 (*Oecophorites*).
AM (adult: whole body)/PIRAS (HT: no. 11)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

vulneratellus Rebel, 1936: 180, fig. 12 (*Borkhausenites*); Skalski, 1976b: 202 (?*Borkhausenites*); Kozlov, 1988: 43 (*Oecophorinites*).
AM (adult: whole body)/BPGM (HT: L–5)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

PARABORKHAUSENITES Kusnezov, 1941: 49.
Type species: *Borkhausenites vicinella* Rebel, 1936.

vicinellus Rebel, 1936: 181, fig. 14 (*Borkhausenites*); Kusnezov,1941: 49 (*Paraborkhausenites*).
AM (adult: whole body)/MNHU (HT: MB-L1)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

SCHIFFERMUELLERIA Hübner, 1825 [extant]

jantharica Skalski, 1977: 17, figs. 12–14, pl. 3: 1, pl. 4: 1, pl. 5: 1 (*Schiffermuelleria*).
AM (adult: whole body)/MEPA (HT: 49/28 G/10 No. 1831/14, 1 MZ/AWS)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

SUBFAMILY *incertae sedis*

GENUS *incertae sedis*

—Grimaldi and Engel, 2005: 577, fig. 13: 40 (Oecophoridae).
AM (adult: whole body)/AMNH/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Hurd *et al.*, 1962: 110 (Oecophoridae).
AM (not stated)/?UCMP/Mexico: Chiapas, Simojovel (Mexican Amber, Simojovel Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

—Kupryjanowicz, 2001: 62, fig. 82 (Oecophoridae) [multiple species].
AM (adult: whole body)/MEPA (3 ex: no. 17444; no. 17863; no. 19167)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.
Comment: The author stated that this record was based on an identification by Skalski.

—MacKay, 1969: 1176, figs. 3, 5b (?Oecophoridae).
AM (larva: whole body)/ZMCD/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Rebel, 1934a: 3, fig. 1, pl. 1: 1 (Tortricidae); Kusnezov, 1941: 69 (Oecophoridae).
AM (larva: whole body)/BPGM (1 ex: H-3)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Skalski, 1990c: 164 [in table] (Oecophoridae).
AM (not stated)/not stated/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

FAMILY *incertae sedis*

—Grimaldi and Engel, 2005: 577, fig. 13: 39 (gelechioid moth).
AM (adult: whole body)/AMNH (1 ex: DR14-278)/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

—Kusnezov, 1941: 59, fig. 47 (Gelechiodeorum gen. et sp. no. 1, ?Oecophoridae); Kozlov, 1988: 54 (?Coleophomorpha).
AM (adult: whole body)/PIRAS (1 ex: no. 6)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Kusnezov, 1941: 60, figs. 48–49 (Gelechiodeorum gen. et sp. no. 2, ?Oecophoridae); Kozlov, 1988: 54 (?Coleophomorpha).
AM (adult: whole body)/PIRAS (1 ex: no. 17)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Jarzembowski, 1980: 269, fig. 56 (Gelechioidea).
AM (adult: partial body and wings)/BMNH (1 ex: In.9042)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

—Peñalver and Grimaldi, 2006: 3 (Gelechioidea).
AM (adult: whole body)/AMNH (1 ex: DR-18-1)/Dominican Republic: Cordillera Septentorial between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.
Comment: This moth is from the same piece of amber in which *Voltinia dramba* (Riodinidae) is included.

—Perkovsky *et al.*, 2003: 429 (Gelechioidea) [multiple species].

AM (adult)/NASU/Ukraine: northern Rovno and Zhitomir Regions, Klesov locality (Rovno Amber, Obukhov Fm.)/Priabonian, Late Eocene.

Questionably placed in Gelechioidea

YPSOLOPHUS auct Germar, 1837: [23] (Tineidae) (nec Fabricius, 1798 [extant]); Kozlov, 1988: 55 (Coleophoromorpha).

insignis Germar, 1837: [23], pl. 20 (*Ypsolophus*).
CI (adult: whole body)/not stated [lost?]/Germany: former Rhine Province, vicinity of Bonn/?Aquitanian, Early Miocene.

GENUS *incertae sedis*

—Skalski, 1977: 20, pl. 4: 2 (inclusion 2).
AM (adult: head)/MEPA (1 ex: G/22 No. 2001/5, 5 MZ/AWS)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Superfamily ZYGAENOIDEA Latreille, 1809 [extant]

Family LIMACODIDAE Duponchel, 1845 [extant]

GENUS *incertae sedis*

—Blair, 1927: 140 (cf. *Limacodes*).
AS (adult: wings)/originally AOFT [not traced]/Trinidad: oil-bearing sand (Kerogen-rich sandstone)/?Gelasian, ?Late Pliocene.
Comment: The author suggested that it is allied to the extant genus *Limacodes*.

Family ZYGAENIDAE Latreille, 1809 [extant]

Subfamily PROCRIDINAE Boisduval, 1828 [extant]

—McNamara *et al.*, 2011: 2 (forester moths).
CI (adult: whole body)/FNSF (2 ex)/Germany: Hesse, S Frankfurt, near Darmstadt, Messel oil shale-layers (Messel Fm.)/early Lutetian, Middle Eocene.

Subfamily ZYGAENINAE Latreille, 1809 [extant]

cf. *NEUROSYMPLOCA* Wallengren, 1858 [extant]

oligocenica Fernández-Rubio and Nel, 2000: 8, figs. 1–5 (?*Neurosymploca*).
CI (adult: whole body)/MNHN (HT: MNHN-LP-R 55185 = no. 3754), private collection, Francine Papier, near Strasbourg, France (1 ex)/ France: Alpes-de-Haute-Provence, Céreste (Calcaires de Montfuron Fm. or Calcaites de Vachères Fm.)/Rupelian (= Stampien), Early Oligocene (Heie and Lutz, 2002).

cf. *ZYGAENA* Fabricius, 1775 [extant]
= *Zygaenites* (nec Burgeff, 1951); Reiss, 1936: 556. Nomen nudum [no description].
= *Palaeozygaena* Reiss, 1936: 556. Nomen nudum [no description].

miocaenica Reiss, 1936: 556, pl. 7 (?*Zygaena*).
CI (adult: whole body)/SMNS (HT: Nr. 22342)/Germany: Baden–Württemberg, Esslingen, Randecker Maar ("dysodile beds")/Burdigalian, Early Miocene.

turolensis Fernández-Rubio *et al.*, 1991: 80, figs. 2–13, 15: 3 (?*Zygaena*); Fernández-Rubio and Peñalver, 1994: 40, figs. 2–6.
CI (adult: whole body)/MNCN (HT: I-16888), MPMV (1295a-RM; 1295b-RM)/Spain: Teruel, Rubielos de Mora ("bituminous rhythmites")/Burdigalian, Early Miocene (Peñalver and Engel, 2006).

ZYGAENITES Burgeff, 1951: 3.
Type species: *Zygaenites controversus* Burgeff, 1951.

controversus Burgeff, 1951: 2–3, figs. 1c, 1d (*Zygaenites*).
CI (adult: whole body)/SMNS (HT and CHT)/Germany: Baden–Württemberg, Esslingen, Randecker Maar ("dysodile beds")/Burdigalian, Early Miocene.

GENUS *incertae sedis*

—Leestmans, 1983: 73, fig. 14 (Zygaenidae).
CI (adult: whole body)/ENSM (lost)/France: Bouches-du-Rhone, Aix-en-Provence ("laminites lacustres")/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).
Comment: Only a photo taken by Théobald in 1935 is extant.

Questionably placed in Zygaenidae

—de Serres, 1829: 230 (*Zygaena* [*s. l.*]).
= *Zyganena* [sic] sp.; Théobald, 1937: [in table 11].
CI (adult: not stated)/originally IGMF [lost?]/France: Bouches-du-Rhone, Aix-en-Provence ("laminites lacustres")/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).
Comment: Leestmans (1983) mentioned the possibility that the specimen in de Serres (1829) is the same as one of the fossils photographed by Théobald. The latter specimen is also missing.

Superfamily COSSOIDEA Leach, 1815 [extant]

Family COSSIDAE Leach, 1815 [extant]

KLEOPATHRA Martins-Neto, 1998a: 75.
Type species: *Kleopathra noctodiva* Martins-Neto, 1998.

nemogypsia Martins-Neto, 1998a: 76, fig. 1b (*Kleopathra*).
CI (adult: forewing)/DGUG (HT: UnG/IT-034)/Brazil: São Paulo, Tremembé City, near Padre Eternal, Fazenda Santa Fé (Tremembé Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

noctodiva Martins-Neto, 1998a: 76, fig. 1a (*Kleopathra*).
CI (adult: forewing)/DGUG (HT: UnG/IT-033)/Brazil: São Paulo, Tremembé City, near Padre Eternal, Fazenda Santa Fé (Tremembé Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

Questionably placed in Cossidae

GURNETIA Cockerell, 1921: 472 (Cossidae); Jarzembowski, 1980: 275 (?Cossidae); Carpenter, 1992: 380 (uncertain).
Type species: *Gurnetia durranti* Cockerell, 1921.

durranti Cockerell, 1921: 473, fig. 38 (*Gurnetia*); Jarzembowski, 1980: 275, figs. 60, 66.
CI (adult: partial forewing)/BMNH (HT: In.24324)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

GENUS *incertae sedis*

—Richter and Storch, 1980: 365, fig. 14 (Cossidae).
GC (adult: cuticular fragments)/FNSF/Germany: Hesse, S Frankfurt, near Darmstadt, Messel oil shale-layers (Messel Fm.)/early Lutetian, Middle Eocene.

Family CASTNIIDAE Boisduval, 1828 [extant]

DOMINICKUS Tindale, 1985: 35.
Type species: *Dominickus castinoides* Tindale, 1985.

castinoides Tindale, 1985: 35, figs. 1–3 (*Dominickus*).
CI (adult: forewings)/FMNH (HT: P.22949)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.

Family SESIIDAE Boisduval, 1828 [extant]

Questionably placed in Sesiidae

cf. *Sesia* auct de Serres, 1829: 230 (nec Fabricius, 1775 [extant]).

—de Serres, 1829: 230 (?*Sesia*).
CI (adult: not stated)/originally IGMF [lost?]/France: Bouches-du-Rhone, Aix-en-Provence (“laminites lacustres”)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).

—Hope, 1836: 146 (?*Sesia*).
AM (not stated)/not stated/not stated/not stated.
Comment: It is unclear whether this is the same fossil noted by de Serres (1829). Hope (1836) asserted that he was the “authority” of this fossil specimen.

Superfamily TORTRICOIDEA Latreille, 1802 [extant]

Family TORTRICIDAE Latreille, 1802 [extant]

Subfamily CHLIDANOTINAE Meyrick, 1906 [extant]

POLYVENA Poinar and Brown, 1993: 25.
Type species: *Polyvena horatis* Poinar and Brown, 1993.

horatis Poinar and Brown, 1993: 26, 28, figs. 1–3 (*Polyvena*).
AM (adult: whole body)/originally UCMP [now ?AIOSU] (HT: L-3-24)/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/ Burdigalian, Early Miocene.

Subfamily OLETHREUTINAE Walsingham, 1895 [extant]

ELECTRESIA Kusnezov, 1941: 62.
Type species: *Electresia zalesskii* Kusnezov, 1941.

zalesskii Kusnezov, 1941: 63, figs. 50–52 (*Electresia*).
AM (adult: whole body)/private collection, B. V. Miloradovitsch, Russia (HT: no. 20)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

TORTRICIBALTIA Skalski, 1992: 140.
Type species: *Tortricibaltia diakonoffi* Skalski, 1992.
= *Tortricibaltia* Skalski, 1976b: 203. Nomen nudum [no description].

diakonoffi Skalski, 1992: 140, figs. 1–5 (*Tortricibaltia*).
= *Tortricibaltia diakonoffi* Skalski, 1976b: 203. Nomen nudum [no description].
AM (adult: whole body)/FMNH (HT: LEP.SUCC.49 NHMC/AWS)/Baltic Region (Baltic Amber, Prussian Fm.)/ Lutetian, Middle Eocene.

TORTRICIDROSIS Skalski, 1973b: 339.
Type species: *Tortricidrosis inclusa* Skalski, 1973.

inclusa Skalski, 1973b: 339, figs. 1–5 (*Tortricidrosis*).
AM (adult: whole body)/MNHU (HT: MB L-10=LEP.SUCC.133/AWS)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

cf. *RETINIA* Guenée, 1845 [extant]

cf. *resinella* Linnaeus, 1758 (*Paleana Tortrix*) [extant]; Koponen and Nuorteva, 1973: 21, 34, 60, fig. 24 (*Evetria*) [fossil].
PE and T (larval feeding damage)/LFUF (1 ex: 1000J, R 16)/Finland: Umgebung, Piionsuo Moors (peat deposits)/ Pleistocene.
Fossil plant host: Pinaceae —*Pinus* sp. [stem].

RHOPOBOTA Lederer, 1859 [extant]
—Skalski, 1976b: 203 (*Rhopobota*).
CO (not stated)/not stated/not stated [?East African Copal]/not stated.

Questionably placed in Olethreutinae

GENUS *incertae sedis*

—Skalski, 1992: 144, fig. 7 (?Olethreutinae).

AM (adult: partial body)/FMNH (1 ex: LEP.SUCC.35 NHMC/AWS)/Baltic Region (Baltic Amber, Prussian Fm.)/ Lutetian, Middle Eocene.

Subfamily TORTRICINAE Latreille, 1802 [extant]

SPATALISTIFORMA Skalski, 1992: 142.
Type species: *Spatalistiforma submerga* Skalski, 1992.
= *Spatalistiforma* Skalski, 1976b: 203. Nomen nudum [no description].

submerga Skalski, 1992: 142, fig. 6 (*Spatalistiforma*).
= *Spatalistiforma submerga* Skalski, 1976b: 203. Nomen nudum [no description].
AM (adult: whole body)/ZMCD (HT: 12-4/1957=LEP.SUCC.88 UZMC/AWS)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

SUBFAMILY *incertae sedis*

TORTRICITES Kozlov, 1988: 40.
Type species: not designated.

destructus Cockerell, 1916: 98 (?*Tortrix*); Skalski, 1992: 137 (uncertain). **comb. nov.**
CI (adult: whole body)/USNM (HT: no. 61998 [not found in an inventory by J.-C. Sohn at USNM])/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.
Comment: In the original description, the author noted that he was unsure of the generic position of this fossil. Therefore, the genus name *Tortrix* (?) as used in the original description most likely refers to tortricid-like fossils now synonymous with *Tortricites*. To avoid any confusion with the extant genus *Tortrix* Linnaeus, 1758, we combine this fossil into *Tortricites*.

florissantanus Cockerell, 1907c: 416 (*Tortrix*); Skalski, 1992: 137 (uncertain); Meyer, 2003: 224, fig. 194. **comb. nov.**
CI (adult: whole body)/UCNH (HT: no. 8579)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.
Comment: The name *Tortrix* in Cockerell's usage, i.e. "*Tortrix* (*sensu lato*)", encompassed nearly all tortricids, and thus is not equivalent to the extant valid genus *Tortrix* Linnaeus, 1758. Since there is no difference between *Tortrix* sensu Cockerell (1907c) and the currently valid genus, *Tortricites*, we place this fossil in *Tortricites*.

sadilenkoi Kozlov, 1988: 41, fig. 8 (*Tortricites*).
AM (adult: head, thorax and partial forewing)/private collection, K. M. Sadilenko, Moscow, Russia (HT: no. 4)/ Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

skalskii Kozlov, 1988: 41, fig. 9 (*Tortricites*).
AM (adult: head, partial body and wings)/PIRAS (HT: PIN 964/659; PT: PIN 964/660)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Gravenhorst, 1835: 92 (*Tortrix*). **comb. nov.**
AM (adult)/not stated (part of ca. 40 ex: [lost?])/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.
Comment: The author likened this fossil to several extant Tortricidae, including *Ptycholoma lecheana* (= *Tortrix lecheana*), *Olethreutes arcuellla* (= *Tortrix arcuana*), *Orthotaenia undulana* (= *Tortrix urticana*), and *Ancylis unguicella* (= *Tortrix falcana*). *Tortrix* in this former sense was essentially equal to Tortricidae, not *Tortrix* as currently circumscribed. We therefore place this fossil in *Tortricites*, which was designated specifically to accommodate tortricid-like fossils which cannot be assigned to any tortricid subgroup.

GENUS *incertae sedis*

—Grimaldi and Engel, 2005: 580, fig. 13: 47 (Tortricidae).
AM (adult: whole body)/AMNH (1 ex: DR8-43)/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

—Menge, 1856: 29–30 (Tortricidae) [multiple species].
AM (adult, larva or pupa)/not stated (26 ex: [lost?])/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Poinar, 1992: 287 (Tortricidae).
AM (not stated)/not stated/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

—Skalski, 1973b: 342 (Tortricidae).
AM (not stated)/not stated (1 ex)/Mexico: Chiapas, Simojovel (Mexican Amber, Simojovel Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

Superfamily PTEROPHOROIDEA Latreille, 1802 [extant]

Family PTEROPHORIDAE Latreille, 1802 [extant]

MERRIFIELDIA Tutt, 1905 [extant]

oligocenicus Bigot, Nel and Nel, 1986: 283, figs. 1–4, 5e (*Pterophorus*). **comb. nov.**
CI (adult: whole body)/MNHN (HT: B47277)/France: Bouches-du-Rhone, Aix-en-Provence ("laminites lacustres")/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).
Comment: The authors associated this fossil with the extant *tridactyla-spicidactylus* (= now *malacodactylus*) group, currently placed in *Merrifieldia* following the division of *Pterophorus s. l.* by Gielis (1996). We therefore move it to *Merrifieldia*.

Questionably placed in Pterophoridae

GENUS *incertae sedis*

—Haase, 1890: 26 (*Pterophorus*); Handlirsch, 1908: 628.
CI (not stated)/originally collection of Dr. A. Assmann [now ?NHUW]/not stated/not stated.
Comment: No description or illustration is available for this fossil. Haase (1890) mentioned it based on the drawing provided by Dr. A. Assmann who did not state the depository of this fossil.

—Piton, 1936: 17, 23, fig. 61 (*Lepidopterites*, nomen nudum).
CI (adult: forewing, thorax and abdomen fragments)/MNHN (1 ex: no. 61)/France: Cantal, Puy-de-Dôme, Lac Chambon ("cinerites")/Pliocene.
Comment: It is not clear whether the author intended to propose *Lepidopterites* as a generic name. Although he mentioned that the fossil is close to Pterophoridae, *Lepidopterites* was used to represent its lepidopteran association, not a specific association with any family or genus. In this case, the taxon name *Lepidopterites* is actually a collective name for an order and thus cannot be used as a generic name. Moreover, Piton's description, since it was published after 1930, should meet the requirements of ICZN article 13.1. Since *Lepidopterites* was not accompanied by any description and its definition was not given unambiguously, the name is invalid and rejected.

Superfamily CARPOSINOIDEA Walsingham, 1897

Family COPROMORPHIDAE Meyrick, 1905 [extant]

COPROMORPHA Meyrick, 1886 [extant]

fossilis Jarzembowski, 1980: 270, fig. 52 (*Copromorpha*).
CI (adult: whole body)/BMNH (HT: In.25766)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

GENUS *incertae sedis*

—Skalski, 1990c: 164 [in table] (Copromorphidae).
AM (not stated)/not stated/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Clade Obtectomera Minet, 1986 [extant]

Superfamily THYRIDOIDEA Herrich-Schäffer, 1846 [extant]

Family THYRIDIDAE Herrich-Schäffer, 1846 [extant]

Subfamily SICULODINAE Meyrick, 1884 [extant]

GENUS *incertae sedis*

—Skalski, 1985: 208 (cf. *Rhodoneura*); Skalski, 1990b: 144(Thyrididae).
AM (adult: whole body)/not stated/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.
Comment: Skalski (1985) mentioned that this fossil is similar to the extant *Rhodoneura*.

Superfamily PYRALOIDEA Latreille, 1809 [extant]

Family PYRALIDAE Latreille, 1809 [extant]

Subfamily CHRYSAUGINAE Lederer, 1863 [extant]

PETISCA Martins-Neto, 1998b: 63.
Type species: *Petisca dryellina* Martins-Neto, 1998.

dryellina Martins-Neto, 1998b: 63, fig. 2d (*Petisca*).
CI (adult: forewing)/DGUG (HT: UnG/1T-83)/Brazil: São Paulo, Tremembé City, near Padre Eternal, Fazenda Santa Fé (Tremembé Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

Subfamily PYRALINAE Latreille, 1809 [extant]

GLENDOTRICHA Kusnezov, 1941: 64.
Type species: *Glendotricha olgae* Kusnezov, 1941.

olgae Kusnezov, 1941: 66, figs. 54–57 (*Glendotricha*).
AM (adult: whole body)/private collection, B. V. Miloradovitsch, Russia (HT: no. 20)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Questionably placed in Pyralidae

GALLERITES Kernbach, 1967: 106 (Galleriidae); Carpenter, 1992: 380 (uncertain).
Type species: *Gallerites keleri* Kernbach, 1967. A subsequent designation by Clark *et al.* (1971: 582).

keleri Kernbach, 1967: 106, fig. 6 (*Gallerites*).
CI (adult: whole body)/GPUG (HT: 596-5=13547)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).

FAMILY *incertae sedis*

PYRALITES Heer, 1856: 30.
Type species: *Pyralites obscurus* Heer, 1856. A subsequent designation by Jarzembowski (1980: 276).
Comment: The genus *Pyralites* was originally proposed to accommodate Pyralidae with an unknown generic affiliation. At the time, Pyralidae was the sole family in the superfamily Pyraloidea. Current division of Pyralidae into two separate families, Pyralidae and Crambidae, necessitates emendation of the definition of *Pyralites*. It should now constitute a collective generic name for species of Pyraloidea, which cannot be assigned to any subgroups thereof.

preecei Jarzembowski, 1980: 276, fig. 69 (*Pyralites*).
CI (adult: partial body and wings)/BMNH (HT: I.8640)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

obscurus Heer, 1856: 30, pl. 2: 6 (*Pyralites*); Kozlov, 1988: 55 (uncertain).
CI (adult: partial body and wings)/PMUZ (HT)/France: Bouches-du-Rhone, Aix-en-Provence ("laminites lacustres")/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).

GENUS *incertae sedis*

—Bonde *et al.*, 2008: 143 (Pyralidae).
CI (adult: whole body)/MHMM (1 ex: DK 188)/Denmark: Jutland, Mors Island, Ejerslev Molergrav (Fur Fm.)/late Thanetian, Late Paleocene–Early Eocene.

—Grimaldi and Engel, 2005: 580, fig. 13: 48 (Pyralidae).
AM (larva: whole body)/AMNH/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Questionably placed in Pyraloidea

—Hiura and Miyatake, 1974: 389 (Pyralidae).
CO (adult: whole body)/?OMNH (1 ex: 133B)/Japan: Gifu Pref., Mizunami (Mizunami Amber)/late Pleiostocene.

—Zeuner, 1931: 313–315, pl. 9: 6, 11: 3, 4 (?Pyralidae).
CI (larva: whole body)/SMNS (3 ex: Nr. 11; Nr. 15; Nr. 68)/Germany: Baden–Württemberg, Esslingen, Randecker Maar ("dysodile beds")/Burdigalian, Early Miocene.

Superfamily PAPILIONOIDEA Latreille, 1802 [extant]

Family HESPERIIDAE Latreille, 1809 [extant]

PAMPHILITES Scudder, 1875b: 66.
Type species: *Pamphilites abditus* Scudder, 1875.

abditus Scudder, 1875b: 68, pl. 3: 14, 17, 18 (*Pamphilites*); Nel and Nel, 1986: 343, pl. 1: 1.
CI (adult: forewing)/MVMF (HT: lost); MNHN (NT: IPM B-24308)/France: Bouches-du-Rhone, Aix-en-Provence ("laminites lacustres")/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).
Comment: Scudder (1875b) compared this fossil to South American hesperiids. The South American affinity of this fossil species was, however, disputed by de Jong (2007: 330).

THANATITES Scudder, 1875b: 62.
Type species: *Vanessa vetula* Heyden, 1859.

vetulus Heyden, 1859: 12, pl. 1: 10 (*Vanessa*); Kirby, 1871: 179 (*Araschnia*); Scudder, 1875b: 63, pl. 3: 12, 16 (*Thanatites*).
= *Thanatites juvenalis* Scudder, 1875b: pl. 3: figs. 12, 16. Nomen nudum [print error].
= *Thanatites vetulinus* [sic]; Kozlov, 1988: 49.
CI (adult: whole body)/BMNH (HT: [not found, possibly destroyed])/Germany: Rhineland, Wetterau and Röhn, Niederrhein, Siebengebirge (Rott Fm.)/Chattian, Late Oligocene.

ANDRONYMUS Holland, 1896 [extant]
= *Androgynus* [sic]; Skalski, 1976b: 199.

neander Plötz, 1884 (*Andronymus*) [extant]; Skalski, 1976b: 199 [fossil].
CO (adult: whole body)/BMNH (1 ex: no. 58522)/Tanzania: Zanzibar Island (East African Copal, unconsolidated sediments)/Late Pleistocene.

GENUS *incertae sedis*

–Andersen and Andersen, 1996: 427, fig. 30 (Hesperiidae); Rust, 1998b: 138; Kristensen and Skalski, 1998: 19, fig. 2.6; Bonde *et al.*, 2008: 144.
CI (adult: whole body)/MHMM (1 ex: DK 136)/Denmark: Jutland, Fur Island, Stolleklint Clay (Fur Fm.)/late Thanetian, Late Paleocene.
Comment: Kristensen and Skalski (1998: 19) referred this to "the oldest butterfly fossil so far known."

—Zeuner, 1960: 310 (Hesperiidae).
CO? (not stated)/not stated/not stated/Pleistocene.
Comment: This is one of two Hesperiidae fossils which Zeuner (1960) judged to belong to recent species.

Family RIODINIDAE Grote, 1895 [extant]

Subfamily RIODININAE Grote, 1895 [extant]

Tribe MESOSEMIINI Bates, 1859 [extant]

VOLTINIA Stichel, 1910 [extant]

dramba Hall *et al.*, 2004: 797, fig 1a–i (*Voltinia*); Grimaldi and Engel, 2005: fig. 13.69.
= Riodinidae fossil; Grimaldi, 1996: 88.

= Nymphalidae fossil; Grimaldi and Engel, 2005: fig. 13.68.
AM (adult: whole body)/USNM (HT); M. Murata collection, Kyoto, Japan (PT); E. Morone collection, Torino, Italy (PT); AMNH (1 ex: DR-18-1)/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

Tribe NYMPHIDIINI Bates, 1859 [extant]

THEOPE Doubleday, 1847 [extant]

—DeVries and Poinar, 1997: 1138, fig. 1 (*Theope*).
AM (larva: whole body)/AIOSU (1 ex)/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

Questionably placed in Riodinidae

RIODINELLA Durden and Rose, 1978: 15 (Riodinidae); Hall *et al.*, 2004: 797 (uncertain).
Type species: *Riodinella nympha* Durden and Rose, 1978.

nympha Durden and Rose, 1978: 17, figs. 4, 5, 6e, 6f (*Riodinella*).
CI (adult: whole body)/PLME (HT: no. 3a) and BHM (CHT: no. 3b)/USA: Colorado, Rio Blanco Co., Piceance Creek Basin, Ray Fome (Green River Fm.)/early Lutetian, Middle Eocene.

Family LYCAENIDAE Leach, [1815] [extant]

Subfamily LYCAENINAE Leach, [1815] [extant]

cf. *THECLA* Fabricius, 1807 [extant]

—Benassi, 1896: 318 (cf. *Thecla*).
CI (larva)/not stated [lost?]/Italy: Centovalli, Val Vigezzo ("argille sabbiose")/Pleistocene or Holocene.

SUBFAMILY incertae sedis

AQUISEXTANA Théobald, 1937: 160.
Type species: *Aquisextana irenaei* Théobald, 1937.

irenaei Théobald, 1937: 160, figs. 2, 3, pl. 1: 1, pl. 2: 1 (*Aquisextana*).
= a fossil *Polyommatus*?; Scudder, 1875b: 85.
CI (adult: whole body)/IGMF (HT: MA 1)/France: Bouches-du-Rhone, Aix-en-Provence ("laminites lacustres")/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).

Questionably placed in Lycaenidae

LITHOPSYCHE Butler, 1889: 294 (Euchemidae, Geometroidea); Jarzembowski, 1980: 283 (Riodinidae); Hall *et al.*, 2004: 799 (uncertain).
Type species: *Lithopsyche antiqua* Butler, 1889.
= *Calospilites* van Schepdael, 1974: 9, 15, 18. An unnecessary replacement name.
Type species: *Lithopsyche antiqua* Butler, 1889.

antiqua Butler, 1889: 294, pl. 31: 3, 6 (*Lithopsyche*); Jarzembowski, 1980: 283, figs. 74, 77.
CI (adult: whole body)/BMNH (HT: I.19984)/United Kingdom: England, Isle of Wight, Gurnet Bay (Bouldnor Fm.)/Late Priabonian, Late Eocene.

LYCAENITES Rebel, 1898: 742 (Lycaenidae); Carpenter, 1992: 380 (uncertain).
Type species: *Lycaenites gabbroensis* Rebel, 1898.

gabbroensis Rebel, 1898: 742, pl. 1: 5, 7 (*Lycaenites*).
CI (adult: whole body)/NHMW (HT: 1898/0013/0005; CHT: 1898/0013/0006)/Italy: Tuscany, Gabbro/Messinian, Late Miocene (Baciu *et al.* 2005).

—Bachofen-Echt, 1949: 150 (*Lycaenites*).
AM (not stated)/not stated [?BPGM, not found in an inventory by J.-C. Sohn at BPGM])/not stated/not stated.
Comment: It is unclear whether the author was referring to Gravenhorst's (1835) record or to an undescribed fossil. He assigned this record to *Lycaenites* without giving any explanation.

GENUS *incertae sedis*

—Gravenhorst, 1835: 93 (*Papilio*); Giebel, 1856: 187 (undescribed butterfly); Scudder, 1875b: 87 (*Thecla*, unconfirmed).
AM (larva)/not stated (part of ca. 40 ex: [lost?])/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.
Comment: The author compared these specimens to an extant lycaenid, *Satyrium w-album* (= *Papilio w. album* auct), which is why we place it here.

Family NYMPHALIDAE Swainson, 1827 [extant]

Subfamily BIBLIDINAE Boisduval, 1833 [extant]

DYNAMINE Hübner, 1819 [extant]

alexae Peñalver and Grimaldi, 2006: 7, figs. 2d, 3, 4, 5 (*Dynamine*).
AM (adult: partial forewing, whole hindwing and abdomen, mid- and hindleg)/AMNH (HT: DR-18-2)/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

Subfamily DANAINAE Boisduval, 1833 [extant]

ARCHAEOLYCOREA Martins-Neto, 1989: 380.
Type species: *Archaeolycorea ferreirai* Martins-Neto, 1989.

ferreirai Martins-Neto, 1989: 380, fig. 4a (*Archaeolycorea*).
CI (adult: forewing)/IGEO (HT: 5618-I)/Brazil: São Paulo, near the municipality of Taubaté (Tremembé Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

—Martins-Neto, 1989: 380, pl. 1: e (*Archaeolycorea*).
CI (pupa)/IGUSP (1 ex: GP/T-1642)/Brazil: São Paulo, Tremembé, along the road that connects Rodovia Presi-

dente Dutra with Campos do Jordão (Tremembé Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

—Martins-Neto, 1989: 381 (*Archaeolycorea*).
CI (pupa)/IGUSP (1 ex: GP/T-1643)/Brazil: São Paulo, Taubaté, Estiva District, Argila Vírgllio, Mineração Company (Tremembé Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

GENUS *incertae sedis*

—Brito and Ribeiro, 1975: 109, pl. 1: 3, pl. 2 (Danaidae).
CI (adult: fore- and hindwing)/IGEO (1 ex: no. 311)/Brazil: São Paulo, Municipe de Tremembé, la Fazenda Santa Fe (Tremembé Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

Subfamily LIBYTHEINAE Boisduval, 1829 [extant]

LIBYTHEANA Michener, 1943 [extant]
= *Barbarothea* Scudder, 1890: 29. Nomen nudum [no description].
= *Barbarothea* Scudder, 1892: 21.
Type species: *Barbarothea florissanti* Scudder, 1892.
= *Prolibythea* Scudder, 1889: 461.
Type species: *Prolibythea vagabunda* Scudder, 1889.

florissanti Scudder, 1892: 23, figs. 1–5 (*Barbarothea*); Shields, 1985: 13, 18, 20 (*Libythea*); Kawahara, 2009: 273 (*Libytheana*).
CI (adult: whole body)/originally private collection, S. H. Long (not found according to Meyer, 2003)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.

vagabunda Scudder, 1889: 465, pl. 53: 4–9 (*Prolibythea*); Shields, 1985: 13, 20 (*Libythea*); Kawahara, 2009: 273 (*Libytheana*).
CI (adult: whole body)/MCZH (HT: no. 16353)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.

Subfamily SATYRINAE Boisduval, 1833 [extant]

cf. *LETHE* Hübner, 1819 [extant]

corbieri Nel, Nel and Balme, 1993: 21, figs. 1–3 (?*Lethe*); Pfretzschner, 1998: 59, figs. 1–3.
CI (adult: whole body; forewing)/PNRL (HT and CHT) and GPUT (1 ex)/France: Alpes-de-Haute-Provence, Céreste (Calcaires de Montfuron Fm. or Calcaites de Vachères Fm.)/Rupelian (= Stampien), Early Oligocene (Heie and Lutz, 2002).

LETHITES Scudder, 1875b: 34. A replacement name for *Satyrites* Scudder, 1872.
Type species: *Satyrites reynesii* Scudder, 1872.
= *Lethites* Scudder, 1875a: 265. Nomen nudum (see Hemming, 1967: 254).
= *Satyrites* Scudder, 1872: 66 [preoccupied by Blanchard and Brullé (1840)].
= *Latyrites* [sic]; Brodie, 1873: 17.

reynesii Scudder, 1872: 66, pl. 7 (*Satyrites*); Scudder, 1875b: 37, pl. 1: 2, 5 (*Lethites*).
= *Latyrites* [sic] *beynesii* [sic]; Brodie, 1873: 17.
CI (adult: whole body)/MVMF (HT)/France: Bouches-du-Rhone, Aix-en-Provence ("laminites lacustres")/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).

MYLOTHRITES Scudder, 1875b: 44.
Type species: *Vanessa pluto* Heer, 1849.

pluto Heer, 1849: 179, pl. 14: 4 (*Vanessa*); Edwards, 1868: 160 (*Argynnis*); Butler, 1873: 127, pl. 48: 7 (?*Junonia*); Scudder, 1875b: 44 (*Mylothrites*).
CI (adult: whole body)/NHMW (HT: 1940/0001/0011)/Croatia: Calicia, Radoboj (Brown Coal deposit, lignite)/ Burdigalian, Early Miocene (Rasnitsyn and Zherikhin, 2002).

—Heer, 1849: 180, pl. 14: 5 (*Vanessa*); Scudder, 1875b: 49–50, fig. 1, pl. 2: 15 (*Mylothrites*).
= *Vanessa pluto* Heer, 1849: 180 (part).
CI (adult: hindwing)/NHMG (1 ex)/Croatia: Calicia, Radoboj (Brown Coal deposit, lignite)/Burdigalian, Early Miocene (Rasnitsyn and Zherikhin, 2002).

NEORINELLA Martins-Neto, Kucera-Santos, Vieira and Fragoso, 1993: 6.
Type species: *Neorinella garciae* Martines-Neto *et al.*, 1993.

garciae Martins-Neto, Kucera-Santos, Vieira and Fragoso, 1993: 7, figs. 2–3, pl. 1–2 (*Neorinella*).
CI (adult: whole body)/DGUG (HT)/Brazil: São Paulo, Bacia de Taubaté (Tremembé Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

NEORINOPIS Butler, 1873: 127.
Type species: *Cyllo sepulta* Boisduval, 1840.
= *Neorinopsis* [sic]; Théobald, 1937: [in table 11].

sepulta Boisduval, 1840: 371, pl. 8 (*Cyllo*); Kirby, 1871: 39 (?*Antirrhaea*); Butler, 1873: 127, pl. 48: 3 (*Neorinopis*); Nel and Nel, 1986: 346, pl. 1–2.
= *Papilio Satyrus* sp.; de Serres, 1829: 230.
= ?*Nymphale* sp.; Duponchel in Boisduval, 1838: 52.
= ?*Cyllo* sp.; Boisduval in Rambur, 1839: xi–xii.
= Vanessides; Lefebvre, 1851: 74.
= *Cullo* [sic] *sepulta*; Nel *et al.*, 1993: 31.
CI (adult: wing)/MNHN (HT: IPM B-24309)/France: Bouches-du-Rhone, Aix-en-Provence (“laminites lacustres”)/ Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).

PSEUDONEORINA Nel and Descimon, 1994: 292.
Type species: *Pseudoneorina coulleti* Nel and Descimon, 1994.

coulleti Nel and Descimon, 1994: 292, figs. 1–5 (*Pseudoneorina*).
= butterfly; Henrotay, 1986: 272, 276 [in legend], pl. 2: 1.
CI (adult: whole body)/MNHN (HT: no. 2486); “Collection Coullet à Barrème” (PT); and private collection, Michel Henrotay/France: Alpes-de-Haute-Provence, Céreste (Calcaires de Montfuron Fm. or Calcaires de Vachères Fm.) and Dauphin (“laminites lacustres”)/Rupelian (= Stampien), Early Oligocene (Heie and Lutz, 2002).
Note: Dr. André Nel informed us that an undescribed butterfly fossil from Henrotay (1986) is actually conspecific with *Pseuconeorina coulleti* Nel and Descimon.

GENUS *incertae sedis*

—CoBabe *et al.*, 2002: 18, fig. 4c (Satyrinae).

CI (adult: forewing)/not stated/USA: Montana, Lewis and Clark Co., SE of Helena, western side of Canyon Ferry Reservoir/Chattian, Late Oligocene.

—Durden and Rose, 1978: 2 (Satyridae) [in footnote].
CI (not stated)/private collection, Lloyd Gunther, USA/USA: Colorado, Rio Blanco Co., Ray Dome (Green River Fm.)/early Lutetian, Middle Eocene.

—van Schepdael, 1974: 15, 20 (Satyridae).
= Tagfalter [= butterfly]; Wangrin, 1940: 193, fig.
CI (adult: whole body)/private collection, G. Wangrin, Szczecin, Poland (1 ex: [not traced])/Germany: Mecklenburg–West Pomerania, Stettin [now Szczecin] (mineral concretion)/Oligocene.

Subfamily NYMPHALINAE Swinson, 1827 [extant]

AGLAIS Dalman, 1816 [extant]

karaganica Nekrutenko, 1965a: 98 (*Vanessa*); Kozlov, 1988: 52 (*Aglais*).
CI (adult: hindwing)/PIRAS (HT: PIN 254/2936a)/Russia: N Caucasus, Stavropol Krai, Vishnevaya Balka (Karagan horizon)/Langhian, Middle Miocene.
Comment: Kristensen and Skalski (1998: 19) cited the view of R. de Jong that the assignment of this fossil to the extant genus *Aglais* is based on inadequate evidence.

APANTHESIS Scudder, 1889: 459.
Type species: *Apanthesis leuce* Scudder, 1889.

leuce Scudder, 1889: 461, pl. 52: 12, 13 (*Apanthesis*).
CI (adult: forewing)/MCZH (HT: no. 16354)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.
Comment: Comstock (1961) suggested that this species is very close to the extant Holarctic genus *Limenitis* in wing venation.

CHARAXES Ochsenheimer, 1816 [extant]

candiope Godart, 1824 (*Nymphalis*) [extant]; Skalski, 1976b: 198 [fossil].
CO (adult: whole body)/not stated/Tanzania: Zanzibar Island (East African Copal, unconsolidated sediments)/Late Pleistocene.

DOXOCOPA Hübner, 1819 [extant]

wilmattae Cockerell, 1907b: 361, pl. 10 (*Chlorippe*); Meyer, 2003: 224 (*Doxocopa*).
CI (adult: whole body)/MCZH (HT: B602) and USNM (1 ex: no. 58682)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.

HESTINA Westwood, 1850 [extant]

japonica Felder et Felder, 1862 (*Apatura*) [extant]; Fujiyama, 1983b: 122, pl. 1: 1 [fossil].
CI (adult: partial forewing)/NSMT (1 ex: PA12228)/Japan: Tochigi Pref., Shiobara Fossil Lake (Miyajima Fm.)/Early or Middle Pleistocene.

cf. *JUNONIA* Hübner, 1819 [extant]

—Evers, 1907: 130, figs. 2, 3 (*Precis* [= *Junonia*] spp.); Kusnezov, 1941: 69 (Rhopalocera *incertae sedis*).
CO (adult: whole body)/originally private collection, J. von Evers, Hamburg, Germany [now ?GMUH] (2 ex)/Tanzania: Zanzibar Island (East African Copal, unconsolidated sediments)/Late Pleistocene.

JUPITELLIA Carpenter, 1985: 579. A replacement name for *Jupiteria* Scudder, 1889.
= *Jupiteria* Scudder, [1881] 1883: 290. Nomen nudum (see Scudder, 1891: 675).
= *Jupiteria* Scudder, 1889: 448.
Type species: *Jupiteria charon* Scudder, 1889. A homonym of *Jupiteria* Bellardi 1875 [Mollusca: Bivalvia].

charon Scudder, 1889: 450, pl. 52: 14–15 (*Jupiteria*); Carpenter, 1985: 579 (*Jupitellia*).
CI (adult: whole body)/private collection, R. D. Lacoe, Pittston, Pennsylvania, USA (HT: no. 2100)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.

LIMENITIS Fabricius, 1807 [extant]

—Branscheid, 1977: 87, figs. 3, 4 (*Limenitis*).
CI (adult: forewing and partial thorax)/GPUG (1 ex: no. 18558)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).

LITHODRYAS Cockerell, 1909: 79. A replacement name for *Lithopsyche* Scudder, 1889.
= *Lithopsyche* Scudder, 1889: 454.
Type species: *Lithopsyche styx* Scudder, 1889. A homonym of *Lithopsyche* Butler, 1889 [Lepidoptera: ?Riodinidae].

styx Scudder, 1889: 454, pl. 53: 11, 16, 17 (*Lithopsyche*); Cockerell, 1909: 79 (*Lithodryas*).
CI (adult: whole body)/MCZH (HT)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.

NYMPHALITES Scudder, 1889: 457.
Type species: *Nymphalites obscurum* Scudder, 1889.

atavus Charpentier, 1843: 408, pl. 22: 4, pl. 22: 4 (*Sphinx*); Kirby, 1872: 185 (?*Vanessa*), 648 (?*Nymphalis*); Scudder, 1875b: 41, pl. 1: 1, 3, 7 (*Eugonia*); Kozlov, 1988: 52 (*Nymphalites*).
= *Vanessa attavina*; Heer, 1849: 177, pl. 14: 3. Unjustified emendation.
= *Sphinx attavus* [sic]; Heer, 1849: 177.
= ?*Vanessa atovina*; Kirby, 1872: 185. Unjustified emendation.
= ?*Nymphalis atovina*; Kirby, 1872: 648. Unjustified emendation.
CI (adult: partial forewing)/not stated (lost)/Croatia: Calicia, Radoboj (Brown Coal deposit, lignite)/Burdigalian, Early Miocene (Rasnitsyn and Zherikhin, 2002).
Comment: Only illustrations are still extant. The specimen itself is said to be lost (Scudder, 1875b).

obscurus Scudder, 1889: 457, pl. 53: 10–13 (*Nymphalites*).
CI (adult: whole body)/MCZH (HT: no. 7768)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.

scudderi Beutenmüller and Cockerell in Cockerell, 1908: 67, pl. 5: 6 (*Nymphalites*).
CI (adult: whole body)/AMNH (HT) and UCNH [CHT?]/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.

zeuneri Jarzembowski, 1980: 279, figs. 72, 75, 76 (*Nymphalites*).
= *Lithosia* sp.; Smith in Woodward, 1878: 88.
= Butterfly: Scudder in Brodie, 1894a: 168.
= Butterfly: Scudder in Brodie, 1894b: 70.
= ?*Lithosia*: Handlirsch, 1907: 923.
= cf. *Euthalia*: Zeuner, 1960: 310.
CI (adult: fore- and hindwing)/BMNH (HT: I.10384; CHT)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

—Zeuner, 1931: 310–311, pl. 12: 2 (Apaturdi); Kozlov, 1988: 52 (*Nymphalites*).
CI (larva: whole body)/GPUT (1 ex: Nr. 38)/Germany: Baden–Württemberg, Esslingen, Randecker Maar ("dysodile beds")/Burdigalian, Early Miocene.

—Zeuner, 1931: 309–310, pl. 6: 1a–b (?Nymphalidarum gen. et spec.); Kozlov, 1988: 52 (*Nymphalites*).
CI (larva: whole body)/SMNS (1 ex: Nr. 45)/Germany: Baden–Württemberg, Esslingen, Randecker Maar ("dysodile beds")/Burdigalian, Early Miocene.

PRODRYAS Scudder, 1878: 520.
Type species: *Prodryas persephone* Scudder, 1878.

persephone Scudder, 1878: 524 (*Prodryas*); Scudder, 1889: 443, pl. 52: 1–10.
CI (adult: whole body)/MCZH (HT: MCZ-1=no. 394)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.

VANESSA Fabricius, 1807 [extant]

amerindica Miller and Brown, 1989: 2, figs. 1–4 (*Vanessa*).
CI (adult: whole body)/FFNM (HT: FLFO-108) and FMUF (CHT: UF21999; PT: UF22000)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.
Comment: Miller and Brown (1989) assigned this fossil to the extant genus *Vanessa* and suggested an Old World affinity, based on similarities to extant *V. indica*. de Jong (2007: 331) challenged this argument, calling it premature and speculative.

—Nekrutenko, 1965b: 156, fig. 4 (*Pyrameis*); Kozlov, 1988: 52 (*Vanessa*).
= *Pyrameis fossilis* Nekrutenko, 1965b: 156, fig. 4. Nomen conditionalis (see Kozlov, 1988: 52).
CI (adult: hindwing)/PIRAS (HT: PIN 254/2753)/Russia: N Caucasus, Stavropol Krai, Vishnevaya Balka (Karagan horizon)/Langhian, Middle Miocene.

GENUS *incertae sedis*

—Hammond and Poinar, 1998: 275, figs. 1–3 (Nymphalidae).
AM (larva)/AIOSU/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

SUBFAMILY *incertae sedis*

GENUS *incertae sedis*

—Grote, 1901: 108; Kusnetzov, 1941: 69 (Rhopalocera).
CO (adult: whole body)/RPMH/Tanzania: Zanzibar Island (East African Copal, unconsolidated sediments)/Late Pleistocene.

Family PAPILIONIDAE Latreille, 1802 [extant]

Subfamily PARNASIINAE Duponchel, 1835 [extant]

Tribe LUEHDORFIINI Tutt, 1896 [extant]

DORITITES Rebel, 1898: 735 (Parnasiinae); Nazari *et al.*, 2007: 152 (Luehdorfiini).
Type species: *Doritites bosniaskii* Rebel, 1898.
= *Luehdorfitis* Bryk, 1912: 53. An unnecessary replacement name for *Dorites* Rebel, 1898.
= *Dorititis* [sic]; Zeuner, 1960: 311.

bosniaskii Rebel, 1898: 740, pl. 1: 1–3 (*Doritites*); Bryk, 1912: 53 (*Luehdorfitis*); Bryk, 1913: 121 (*Luehdorfia*).
= *Luehdorfitis bosniackii* Bryk, 1912: 53. Unjustified emendation.
CI (adult: whole body)/NHMW (HT: 1898/0013/0001; CHT: 1898/0013/0002)/Italy: Tuscany, Gabbro/Messinian, Late Miocene (Baciu *et al.* 2005).

TRIBE *incertae sedis*

THAITES Scudder, 1875b: 57 (Parnasiinae); Bryk, 1916: 40 (?Papilionidae); Nazari *et al.*, 2007: 152 (uncertain).
Type species: *Thaites ruminianus* Scudder, 1875.
= *Thaites* Heer, 1861: 153, 205. Nomen nudum (see Hemming, 1967: 436).
= *Thaites* de Saporta, 1872: 342. Nomen nudum (see Hemming, 1967: 436).
= *Thaitites* [sic]: Bryk, 1916: 42.

ruminianus Scudder, 1875b: 60, pl. 3: 1, 3, 6–10 (*Thaites*).
= *Thaites ruminiana* Heer, 1861: 153, 205. Nomen nudum (see Hemming, 1967: 436).
= *Thaites ruminiana* de Saporta, 1872: 342. Nomen nudum (see Hemming, 1967: 436).
CI (adult: whole body)/PMUZ (HT; 1 ex)/France: Bouches-du-Rhone, Aix-en-Provence ("laminites lacustres")/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).

GENUS *incertae sedis*

—Leestmans, 1983: 73, fig. 13 (Parnassinae).
CI (adult: whole body)/ENSM (lost)/France: Bouches-du-Rhone, Aix-en-Provence ("laminites lacustres")/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).
Comment: Only a photo taken by Théobald in 1935 is extant.

Subfamily PAPILIONINAE Latreille, 1802 [extant]

PAPILIO Linnaeus, 1758 [extant]

cf. ***maackii*** Ménétriés, 1859 (*Papilio*) [extant]; Fujiyama, 1968: 86, fig. 1, pl. 1: 1 [fossil].
CI (adult: partial forewing)/NSMT (1 ex: no. 7141)/Japan: Tochigi Pref., Shiobara Fossil Lake (Miyajima Fm.)/Early or Middle Pleistocene.

—Bachofen-Echt, 1949: 146 (*Papilio*).
AM (not stated)/not stated [?BPGM: not found in an inventory by J.-C. Sohn at BPGM])/not stated/not stated.
Comment: It is unclear whether Bachofen-Echt was referring to an undescribed amber inclusion or simply citing a previous record. The author pointed to an amber inclusion which can be assigned to "the family that *Papilio* belongs to."

Subfamily PRAEPAPILIONINAE Durden and Rose, 1978: 5

PRAEPAPILIO Durden and Rose, 1978: 5.
Type species: *Praepapilio colorado* Durden and Rose, 1978.
Comment: Kristensen and Skalski (1998: 19) regarded the two species of *Praepapilio* to be "the oldest named butterflies." de Jong (2007: 320) suggested that this genus belongs at the base of the Papilionidae.

colorado Durden and Rose, 1978: 6, figs. 1, 6a, 6b (*Praepapilio*).
CI (adult: whole body)/private collection, Hugh Rose, New Hampshire, USA (HT: no. 1)/USA: Colorado, Rio Blanco Co., Ray Dome (Green River Fm.)/early Lutetian, Middle Eocene.

gracilis Durden and Rose, 1978: 11, figs. 2, 3, 6c, 6d (*Praepapilio*).
CI (adult: whole body)/private collection, Hugh Rose, New Hampshire, USA (HT: no. 2a) and BHM (CHT: no. 2b)/USA: Colorado, Rio Blanco Co., Ray Dome (Green River Fm.)/early Lutetian, Middle Eocene.

Family PIERIDAE Duponchel, 1835 [extant]

Subfamily PIERINAE Duponchel, 1835 [extant]

BELENOIS Hübner, 1825 [extant]

crawshayi Butler, 1893 (*Belenois*) [extant]; Zeuner, 1942: 415 [fossil].
CO (adult: whole body)/BMNH (1 ex: I.3004)/Tanzania: Zanzibar Island (East African Copal, unconsolidated sediments)/Late Pleistocene.

COLIATES Scudder, 1875b: 51.
Type species: *Coliates proserpina* Scudder, 1875.

proserpina Scudder, 1875b: 52, pl. 2: 5 (*Coliates*).
CI (adult: forewing)/originally private collection, Count de Saporta [probably now MNHN]/France: Bouches-du-Rhone, Aix-en-Provence ("laminites lacustres")/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).

OLIGODONTA Brown, 1976: 2.
Type species: *Oligodonta florissantensis* Brown, 1976.

florissantensis Brown, 1976: 4, figs. 1–3 (*Oligodonta*).
CI (adult: whole body)/FFNM (HT); PSWC (CHT: WC-FL-1)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.
Comment: de Jong (2007: 322) criticized Brown's (1976) interpretation of this fossil and its family assignment.

PIERITES Heer, 1849: 182.

Type species: not designated.

Comment: Heer (1849) did not designate the type species of *Pierites*. Since Heer included only one species, *P. freyeri* Heer, 1849, Hemming (1967) interpreted the specimen as the type species of *Pierites*. This subsequent designation of the type species is problematic, since *P. freyeri* was transferred to the extant genus *Pontia* by Scudder (1875b). *Pierites* is currently used as a collective genus for fossils whose placement in Pieridae is uncertain (e.g. Kozlov 1988). For that reason, type species designation is not required (ICZN 4th edition, Article 13.3.2). We therefore disregard the subsequent designation of the type.

—Branscheid, 1968: 42, figs. 1–2 (*Aporia* cf. *crataegi*); Kozlov, 1988: 50 (*Pierites*).

CI (adult: forewing; hindwing)/GPUG (1 ex)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).

—Branscheid, 1969: 102–103 (*Aporia*); Brauckmann *et al.*, 2001: 37, figs. 2–3 (?*Aporia*). **comb. nov.**

CI (adult: forewing and hindwing)/GPTUC (9 ex: 664-1[4588/a]; 646-2[9507/a]; 646-3[14264/a]; 646-4[17712/a]; 646-5[8472/a]; 646-6[8815]; 646-7[38/116a,b]; 646-8[8471/a]; 646-9[4828])/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).

Comment: Following the example of Kozlov (1988) with regard to other alleged *Aporia* fossils, we treat these specimens as *Pierites* sp.

—Branscheid, 1977: 85, fig. 2 (*Aporia*). **comb. nov.**

CI (adult: hindwing)/originally private collection, A. Straus [now ?GPUG] (1 ex: no. 19563)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al*. 2001).

Comment: Following the example of Kozlov (1988) with regard to other alleged *Aporia* fossils, we treat these specimens as *Pierites* sp.

—Kernbach, 1967: 108, fig. 12 (*Aporia*); Kozlov, 1988: 50 (*Pierites*).

= *Aporia crataegi* L. *fossilis* Kernbach, 1967: 108.

CI (adult: hindwing)/GPUG (1 ex: 596-12[13589])/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).

PONTIA Fabricius, 1807 [extant]

freyeri Heer, 1849: 182, pl. 14: 6, pl. 14: 6 (*Pierites*); Scudder, 1875b: 54, pl. 2: 16, 18 (*Pontia*).

CI (adult: forewing)/originally stated as "k.k. montanistischen Sammlung zu Wien [possibly now GSAV]" (HT: [GSAV or lost?: not found in an inventory by J.-C. Sohn at GSAV])/Croatia: Calicia, Radoboj (Brown Coal deposit, lignite)/Burdigalian, Early Miocene (Rasnitsyn and Zherikhin, 2002).

STOLOPSYCHE Scudder, 1889: 467.

Type species: *Stolopsyche libytheoides* Scudder, 1889.

libytheoides Scudder, 1889: 468, pl. 53: 1–3 (*Stolopsyche*).

CI (adult: whole body)/MCZH (HT: no. 11077)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.

Questionably placed in Pieridae

MIOPIERIS Zeuner, 1942: 409 (Pieridae); Carpenter, 1992: 380 (?Lycaenidae).

Type species: *Miopieris talboti* Zeuner, 1942.

talboti Zeuner, 1942: 409, fig. 1 (*Miopieris*).
CI (adult: whole body)/BMNH (HT)/Germany: Baden–Württemberg, Esslingen, Randecker Maar ("dysodile beds")/Burdigalian, Early Miocene.

GENUS *incertae sedis*

—Branscheid, 1977: 85, fig. 1 (Pieridae).
CI (adult: forewing)/GPUG (1 ex: no. 52-30 979)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).

—Richter and Storch, 1980: 364, fig. 13 (Pieridae).
GC (adult: cuticular fragments)/FNSF/Germany: Hesse, S Frankfurt, near Darmstadt, Messel oil shale-layers (Messel Fm.)/early Lutetian, Middle Eocene.

FAMILY *incertae sedis*

GENUS *incertae sedis*

—Bachofen-Echt, 1949: 147 (Papilionidae).
AM (adult emerging from pupa)/originally private collection, Othenio Abel, Germany [lost?]/not stated/not stated.
Comment: The author referred to "one or two small papilionid butterflies" (147: lines 8 and 9).

—Benassi, 1896: 318 (butterfly).
CI (pupa)/not stated [lost?]/Italy: Centovalli, Val Vigezzo/Pleistocene or Holocene.

—Bonde *et al.*, 2008: 144 (Papilionoidea).
CI (adult: not stated)/NHMD/Denmark: Zutland, Fur Island, Stolleklint Clay (Fur Fm.)/late Thanetian, Late Paleocene.

—Durden and Rose, 1978: 1 (butterfly).
not stated/FFNM (1 ex)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.

—Grote, 1901: 108 (Rhopalocera).
CO (adult: whole body)/RPMH/Tanzania: Zanzibar Island (East African Copal, unconsolidated sediments)/Late Pleistocene.

—Hope, 1836: 146 (*Papilio*); Scudder, 1875b: 87 (extant species).
CO and AM (not stated)/Strong collection [?OUNH: not found in an inventory by J.-C. Sohn at OUNH]/not stated/not stated.
Comment: For unknown reasons, Hope (1936) cited Brendt as the authority. Scudder (1875b) raised the possibility that the fossil is a forgery.

—Jarzembowski, 1980: 284, fig. 63 (Papilionoidea, genus indet.).
CI (adult: partial body and wings)/BMNH (1 ex: In.64545)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.
Comment: Jarzembowski (1980) noted a resemblance of this fossil to Lycaenidae and Nymphalidae.

—Kernbach, 1967: 108 (butterfly).
CI (adult)/GPUG (5 ex)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).

—Larsson, 1975: 197, 204 (Rhopalocera) [multiple species].
CI (adult: wings)/NHMD and FMND (6 ex)/Denmark: NW Jutland, Limfjord area, Mo-clay (Fur and Olst Fms)/ Late Paleocene–Early Eocene.

—Lemdahl, 2000: 307, fig. 5, tbl. 3 (larval jaws of butterflies).
SR (larva: mandibles)/BTVU/Switzerland: SW Alps, Hérémence (Late Glacial Maximum, unconsolidated sediments)/Younger Dryas, Holocene.

Clade Macroheterocera Chapman, 1893 [extant]

Superfamily BOMBYCOIDEA Latreille, 1802 [extant]

Family SATURNIIDAE Boisduval, 1837 [extant]

Subfamily AGLIINAE Packard, 1893 [extant]

AGLIA Ochsenheimer, 1810 [extant]

tau Linnaeus, 1758 (*Phalaena*) [extant]; Lindberg, 1900: 235 [fossil].
SR (larva: thoracic segments)/not stated/Finland: Lohja/Pleistocene.

Subfamily SATURNIINAE Boisduval, 1837 [extant]

Tribe ATTACINI Blanchard, 1840 [extant]

cf. *ROTHSCHILDIA* Grote, 1897 [extant]

fossilis Cockerell, 1914: 271, fig. 34 (?*Attacus*); Schüssler, 1933: 55 (*Rothschildia*).
CI (adult: partial forewing)/UCNH/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.

Tribe BUNAEINI Packard, 1902 [extant]

cf. *CIRINA* Walker, 1855 [extant]

cf. *forda* Westwood, 1849 (*Saturnia*) [extant]; Kitching and Sadler, 2011: 551–552, figs. 20.1a–c, g–h [fossil].
SI (pupa: whole body)/not stated (1 ex: EP 352/03)/Tanzania: Laetoli, Upper Laetoli Beds (Laetoli Fm.)/?Gelasian, Late Pliocene.

SUBFAMILY *incertae sedis*

—Kunz, 2010: 43, 45, figs. (Saturniidae cocoons)
SI (cocoon)/various institutes (> 37 ex)/France: Alsace, North Middle Upper Rhine Graben, Bouxwiller quarry (Bouxwiller Fm.)/Lutetian, Middle Eocene.

Family SPHINGIDAE Latreille, 1802 [extant]

MIOCLANIS Zhang, Sun and Zhang, 1994: 82.

Type species: *Mioclanis shanwangiana* Zhang, Sun and Zhang, 1994.

shanwangiana Zhang, Sun and Zhang, 1994: 82, figs. 58, 59, pl. 10: 4 (*Mioclanis*).
CI (adult: whole body)/PFDL (HT: SK000361)/China: Shandong, Lingu, Shanwang (Shanwang Fm.)/Langhian, Middle Miocene.

GENUS *incertae sedis*

—Churcher, 1966: 990, fig. 15 (Sphingidae).
AS (adult: proboscis)/ROMUT/Peru: Piura, Talara (Lobitos Tablazo Fm.)/Late Pleistocene.

—Zhang, 1989: 94, pl. 20: 3 (Sphingidae).
CI (adult: whole body)/SFML (1 ex: no. 820157)/China: Shandong, Lingu, Shanwang (Shanwang Fm.)/Langhian, Middle Miocene.

Questionably placed in Sphingidae

SPHINGIDITES Kernbach, 1967: 108 (Sphingidae); Kozlov, 1988: 23, 55 (uncertain).
Type species: *Sphingidites weidneri* Kernbach, 1967. A subsequent designation by Clark *et al.* (1971: 582).
Comment: Brauckmann *et al.* (2001) held Kernbach's description of this genus to be invalid because of the lack of a diagnosis. It is not clear what Kernbach originally intended with this genus. We assume that it was designated to accommodate sphingid-like fossils whose association is not convincing. In this case, the collective genus does not need to have a type species or a diagnosis. The circumscription of the genus is not affected by the type species unnecessarily designated by Clark *et al.* (1971).

weidneri Kernbach, 1967: 108, fig. 11 (*Sphingidites*).
CI (larva: whole body)/GPUG (HT: 596-11=3435)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).

GENUS *incertae sedis*

—Berendt, 1830: 37 (*Sphinx* [*s. l.*]); Kusnezov, 1941: 69 (Lepidoptera *incertae sedis*).
AM (?adult)/not stated/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Haase, 1890: 26 (*Sphinx*); Handlirsch, 1908: 628.
CI (not stated)/Dr. A. Assmann's collection [now ?NHUW]/not stated/not stated.
Comment: No description or illustration is available for this fossil. Haase (1890) mentioned the specimen based on a drawing provided by Dr. A. Assmann who did not state the depository of this fossil.

—Leakey, 1952: 624, fig. 1 (lepidopterous larva); Kitching and Sadler, 2011: 550 (probably Sphingidae).
SI (larva: whole body)/British-Kenya Miocene Expedition Collection, BMNH (1 ex)/Kenya: South Nyanza, Rusinga and M'fwangano Islands in Lake Victoria (Hiwegi Fm.)/Burdigalian, Early Miocene (van Couvering and Miller, 1969).

—Schöberlin, 1888: 69 (Sphingidae).
CI (larva: whole body)/originally Massmann Collection [private?]/Switzerland: Neuchâtel Canton, Oeningen ("Molasseformatien")/Messinian, Late Miocene.
Comment: The author likened this fossil to the larva of the extant *Hemaris fuciformis* in size.

—Zeuner, 1927: 321, figs. 1–3, 5 (“Sphingidenraupe”)
SI (larva: whole body)/GPUT (1 ex)/Germany: Baden–Württemberg, Esslingen, Randecker Maar (“dysodile beds”)/Burdigalian, Early Miocene.

Family BOMBYCIDAE Latreille, 1802 [extant]

Questionably placed in Bombycidae

BOMBYCITES Heer, 1849: 183; Handlirsch, 1908: 927 (uncertain).
Type species: *Bombycites oeningensis* Heer, 1849.

buechii Heer, 1865: 397, fig. 310 (*Bombycites*).
CI (larva: whole body)/not stated [maybe now PMUZ]/Switzerland: Neuchâtel Canton, Oeningen (“Molasseformatien”)/Messinian, Late Miocene.
Comment: The figure accompanying Heer’s original description is insufficient to show any affinity with any family of Lepidoptera (Kozlov 1988).
oeningensis Heer, 1849: 183, pl. 14: 7 (*Bombycites*).
CI (adult: partial body and wings)/PMUZ (HT)/Switzerland: Neuchâtel Canton, Oeningen (“Molasseformatien”)/Messinian, Late Miocene.
Comment: Handlirsch (1908) erroneously gave “pupa” as the stage of the fossil.

FAMILY *incertae sedis*

GENUS *incertae sedis*

—George, 1952: 88, fig. 55 (Sphingidae); Kozlov, 1988: 55 (uncertain).
CI (adult: wing scale)/SJCA (> 1 ex: slide no. 16)/Pakistan: Punjab, Salt Range, Warcha and Jankush Nulla Gorges (Saline Series dolomite)/Late Eocene (Lamba, 1944).

—Richter and Storch, 1980: 365, fig. 16 (?Sphingidae).
GC (adult: cuticular fragments)/FNSF/Germany: Hesse, S Frankfurt, near Darmstadt, Messel oil shale-layers (Messel Fm.)/early Lutetian, Middle Eocene.

Superfamily GEOMETROIDEA Leach, 1815 [extant]

Family GEOMETRIDAE Leach, 1815 [extant]

GEOMETRIDITES Kernbach, 1967: 107.
Type species: *Geometridites repens* Kernbach, 1967. A subsequent designation by Clark *et al.* (1971: 582).
Comment: Kernbach (1967) included two species when he proposed this genus but did not designate a type. Clark *et al.* (1971), recognizing this problem, made the genus name available by designating one species as the type. From this, Fletcher (1979) attributed the authorship of *Geometridites* to Clark *et al.* (1971). In the most recent code (ICZN 4th edition, Article 13.3.2), the requirement for type designation has been relaxed for collective fossil genera. Therefore, *Geometridites* is available even without a type species and authorship should be attributed to Kernbach (1967).

jordani Kernbach, 1967: 107, fig. 8 (*Geometridites*).
CI (adult: wings)/GPUG (HT: 596-7=10119 and 10119a)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).

larentiiformis Jarzembowski, 1980: 278, fig. 71 (*Geometridites*).
CI (adult: partial forewing)/BMNH (HT: I.8866/8935)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

repens Kernbach, 1967: 107, fig. 7 (*Geometridites*).
CI (larva: whole body)/GPUG (HT: 596-6=11499/11499a)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).

—Heer, 1861: 153 (*Palaenites*); Kozlov, 1988: 45 (*Geometridites*).
= *Phalaenites proserpinae* Heer, 1861: 153. Nomen nudum (see Kozlov, 1988: 45).
= *Phalaena proserpinae*; van Schepdael, 1974: 14.
not stated (adult?)/not stated/France: Bouches-du-Rhone, Aix-en-Provence ("laminites lacustres")/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).

cf. *HYDRIOMENA* Hübner, 1825 [extant]

protrita Cockerell, 1922: 1, fig. 1 (?*Hydriomena*).
CI (adult: forewing)/AMNH (HT)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.

HYPERYTHRA Guenée, 1857 [extant]

lutea Stoll, 1787 (*Phalaena Geometra*) [extant]; Evers, 1907: 130, fig. 1 [fossil]; Kozlov, 1988: 45 (*Geometridites* sp.).
CO (adult: whole body)/PJEH (1 ex)/Tanzania: Zanzibar Island (East African Copal, unconsolidated sediments)/Late Pleistocene.

GENUS *incertae sedis*

—FIRGNE, 1990: 101, fig. 10.3.1 (pupa type I-A-1).
SR (pupa)/not stated [?OMNH] (1 ex: i-200)/Japan: Nagano Pref., Ikejiri-gawa Hollow, Hill Site excavation site (Nojiri-ko Fm.)/Late Pleistocene.

—Grimaldi and Engel, 2005: fig. 13: 24 (Geometridae).
AM (adult: whole body)/AMNH (1 ex: DR14-20)/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

—Grimaldi and Engel, 2005: 586, fig. 13: 58 (Geometridae).
AM (larva: whole body)/private collection, E. Morone, Torino, Italy (1 ex: M0482)/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

—Grimaldi and Engel, 2005: 586, fig. 13: 59 (Geometridae).
AM (adult: whole body)/AMNH/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

—Handlirsch, 1908: 1133 (Geometridae).
CO (not stated)/NHMW (2 ex)/Benin and Guinea/Pleistocene-Holocene.

—Lewis, 1992: 16 [in table] (Geometridae); Wilson, 1996: 226.

CI (not stated)/not stated [?TBMM or ?CSUM]/USA: Washington State, Ferry Co., Republic (Klondike Mountain Fm.)/Lutetian, Middle Eocene.

Questionably placed in Geometridae

ANGERONA auct Giebel, 1862: 317 (Geometridae) (nec Duponchel, 1829 [extant]); Kusnezov, 1941: 68 (Macrolepidoptera *incertae sedis*).

electrina Giebel, 1862: 317 (*Angerona*).
= *Angerona electrica* [sic]; Oppenheim, 1885: 347
CO (adult: whole body)/CMNH (1 ex: no. 4177)/not stated/possibly Holocene (after Bauer *et al.* 2005).

PHALAENITES Heer, 1849: 186; Kozlov, 1988: 55 (uncertain).
Type species: *Phalaenites crenata* Heer, 1849. A subsequent designation by Flecher (1979).

obsoletus Heer, 1849: 187, pl. 14: 12 (*Phalaenites*).
CI (adult: forewing)/originally stated as "k.k. montanistischen Sammlung zu Wien (possibly now GSAV)" (HT: [GSAV or lost?: not found in an inventory by J.-C. Sohn at GSAV])/Croatia: Calicia, Radoboj (Brown Coal deposit, lignite)/Burdigalian, Early Miocene (Rasnitsyn and Zherikhin, 2002).

crenatus Heer, 1849: 186, pl. 14: 11 (*Phalaenites*).
CI (adult: forewing)/originally stated as "k.k. montanistischen Sammlung zu Wien (possibly now GSAV)" (HT: [GSAV or lost?: not found in an inventory by J.-C. Sohn at GSAV])/Croatia: Calicia, Radoboj (Brown Coal deposit, lignite)/Burdigalian, Early Miocene (Rasnitsyn and Zherikhin, 2002).

PROBLONGOS Mérit and Mérit, 2008: 29, 31.
Type species: *Problongos baudiliensis* Mérit and Mérit, 2008.

baudiliensis Mérit and Mérit, 2008: 31, figs. 3, 4a (*Problongos*).
CI (adult: whole body)/private collection, Xavier Mérit, Palaiseau, France (HT)/France: Ardèche, Saint-Bauzile (diatomite)/Tortonian, Late Miocene.
Comment: The authors associated this fossil with the Geometridae, based solely on superficial similarity in wing shape. The evidence is weak, and we therefore treat this as a questionable geometrid fossil.

GENUS *incertae sedis*

—Harris and Raine, 2002: 461, fig. 1 (Geometridae).
SR (adult: saccular sclerite of male genitalia)/IGNS (1 ex: L10414/1)/New Zealand: Canterbury, Rakaia Gorge, north bank of Rakaia River (Broken River Fm.)/Albian–Turonian, Late Cretaceous.
Comment: The authors associated this fossil with the larentiine genus *Helastia*. It is not clear whether the supposed saccular sclerite is in fact a part of the male genitalia as opposed to something else. Even if the authors' interpretation is correct, the fragment supports no diagnosis as to family. We therefore treat this as a questionable geometrid fossil.

Superfamily NOCTUOIDEA Latreille, 1809 [extant]

Family NOCTUIDAE Latreille, 1809 [extant]

Subfamily PLUSIINAE Boisduval, [1828] [extant]

GENUS *incertae sedis*

—FIRGNE, 1990: 101, fig.10.3.2 (pupa type II-D).
SR (pupa)/not stated [?OMNH] (1 ex: i-583)/Japan: Nagano Pref., Ikejiri-gawa Hollow, Hill Site excavation site (Nojiri-ko Fm.)/Late Pleistocene.

Subfamily NOCTUINAE Latreille, 1809 [extant]

EUROIS Hübner, 1821 [extant]

occulta Linnaeus, 1757 (*Noctua*) [extant]; Iversen, 1934: 343, 351, 354, 356 (*Agrotis*) [fossil].
SR (pupa: partial body)/NHMD? (65 ex)/Denmark: Greenland, Nordmånner-Siedlungen Østerbygden and Vesterbygden (Last Glacial Maximum, unconsolidated sediments)/Late Pleistocene.

Family EREBIDAE Leach, 1815 [extant]

Subfamily ARCTIINAE Leach, 1815 [extant]

Tribe SYNTOMINI Herrich-Schäffer, 1846 [extant]

OLIGAMATITES Kusnezov, 1928: 431.
Type species: *Oligamatites martynovi* Kusnezov, 1928.

martynovi Kusnezov, 1928: 431 (*Oligamatites*).
CI (adult: partial body, forewing and hindwing)/PIRAS (HT: PIN 2113 32/35)/Kazakhstan: Semipalatinsk Prov., Zaisan district, Mount Ashutas, Irtysh river, E of the sixth ravine/Oligocene.

PSEUDONACLIA Butler, 1876 [extant]

puella Boisduval, 1847 (*Naclia*) [extant]; Zeuner, 1943: 144, figs. 1–2 [fossil].
CO (adult: whole body)/BMNH (1 ex: In.17682)/Tanzania: Zanzibar Island (East African Copal, unconsolidated sediments)/Late Pleistocene.

Questionably assigned to Syntomini

CHARIDEA auct Dalman, 1826 (nec Dalman, 1816 [extant]).

metis Dalman, 1826: 497, pl. 5: 19 (*Charidea*); Hope, 1836: 146 (*Pavonia*); Walker, 1854: 277 (?*Euchromia*).
CO (adult: whole body)/originally in possession of J. W. Dalman [not traced]/origin uncertain (Dalman, 1826)/uncertain.

cf. *SYNTOMIS* Ochsenheimer, 1808 [extant]

—Hope, 1836: 146 (*Syntomis* spp.).
CO (not stated)/Hope and Strong collection [?OUNH: not found in an inventory by J.-C. Sohn at OUNH] (3 ex)/not stated/not stated.

Comment: Hope (1836) stated that there were several specimens belonging to this genus. He attributed the "authority" to Westwood, which possibly meant that Westwood would describe them. However, these specimens have never been described.

Tribe ARCTIINI Leach, 1815 [extant]

cf. *ARCTIA* Schrank, 1802 [extant]

—Klebs, 1890: 270 (*Arctia*).
AM (adult: not stated)/not stated [?AMKR] (1 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.
Comment: It is not clear that the author was specifically referring to the genus *Arctia* as currently defined. At the time, this genus name was applied to most large arctiine species. However, given that the specimen is stated to be "of a considerable size", it would be very interesting to determine whether it is actually a large arctiine moth.

TRIBE *incertae sedis*

GENUS *incertae sedis*

—Joseph, 1986: cover page (a moth); Douglas and Stockey, 1996: 1151, fig. 16 (Arctiidae).
CI (adult: whole body)/TBMM (1 ex: no. 66000)/USA: Washington State, Ferry Co., Republic (Klondike Mountain Fm.)/Early Lutetian, Middle Eocene (Pearson and Obradovich, 1977).

—Kernbach, 1967: 107 (Arctiidae).
CI (adult: wings)/originally in Hering collection [lost?]/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).
Comment: This record was based on Dr. E. M. Hering's determination.

Questionably placed in Arctiinae

ARCTIITES Rebel, 1898: 732 (Arctiidae); Kozlov, 1988: 53 (uncertain).
Type species: *Arctiites deletus* Rebel, 1898.

deletus Rebel, 1898: 732, pl. 1: 6 (*Arctiites*).
CI (adult: body and partial forewing)/NHMW (HT: 1898/0013/0004; CHT: 1898/0013/0003)/Italy: Tuscany, Gabbro/Messinian, Late Miocene (Baciu *et al.* 2005).

STAUROPOLIA Skalski, 1988: 21.
Type species: *Stauropolia nekrutenkoi* Skalski, 1988.

nekrutenkoi Skalski, 1988: 22, figs. 1–2 (*Stauropolia*).
CI (adult: partial body and a forewing)/PIRAS (HT: no. 1102/2)/Russia: N Caucasus, near Stavropol Krai, Sengileyevskaya (Karagan horizon)/Langhian, Middle Miocene.

Subfamily LYMANTRIINAE Hampson, 1893 [extant]

cf. *EUPROCTIS* Hübner, 1819 [extant]

—Benassi, 1896: 318 (*Porthesia* [= *Euproctis*]); Handlirsch, 1908: 1133 (Bombycidae).
CI (adult: hindwing)/not stated [lost?]/Italy: Centovalli, Val Vigezzo/Pleistocene–Holocene.

GENUS *incertae sedis*

—Cavallo and Galletti, 1987: 174, pl. 12: 5 (Lymantriidae).
CI (adult: whole body)/MCFE (1 ex)/Italy: Piedmont, Alba, gypsiferous marls/Messinian, Late Miocene.
Comment: The authors did not describe this fossil, but included a drawing of it from an unpublished manuscript by Carlo Sturani.

Questionably placed in Lymantriinae

—Evers, 1907: 132 (Liparidae [= Lymantriinae] larva); Kusnezov, 1941: 69 (uncertain).
CO (larva: whole body)/GMUH (1 ex)/Tanzania: Zanzibar Island (East African Copal, unconsolidated sediments)/Late Pleistocene.

Subfamily CATOCALINAE Boisduval, 1828 [extant]

PHILODARCHIA Martins-Neto, 1998a: 77.
Type species *Philodarchia cigana* Martins-Neto, 1998.

cigana Martins-Neto, 1998a: 77, fig. 1c (*Philodarchia*).
CI (adult: whole body)/DGUG (HT: UnG/IT-058)/Brazil: São Paulo, Tremembé City, near Padre Eternal, Fazenda Santa Fé (Tremembé Fm.)/Late Oligocene–Early Miocene boundary.

Family NOTODONTIDAE Stephens, 1829 [extant]

GENUS *incertae sedis*

—Prokop, 2003: 335 [in table], 338 (Notodontidae).
CI (adult: forewing)/not stated [NMPC or private collection, Zdeněk Dvořák]/Czech Republic: Bohemia, Ústí Region, Bilina Mine (Most Fm.)/Aquitanian, Early Miocene.

Questionably placed in Notodontidae

CERURITES Kernbach, 1967: 107; Carpenter, 1992: 380 (uncertain).
Type species: *Cerurites wagneri* Kernbach, 1967. A subsequent designation by Clark *et al.* (1971: 582).

wagneri Kernbach, 1967: 107, fig. 10 (*Cerurites*).
CI (adult: whole body)/GPUG (HT: 596-10=12202)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).

FAMILY *incertae sedis*

NOCTUITES Heer, 1849: 185.
Type species: *Noctuites haidingeri* Heer, 1849. A subsequent designation by Nye (1975).

= *Xyleutites* Kozhantchikov, 1957: 676 (Cossidae) [synonymized by Kozlov (1988: 45)].
Type species: *Xyleutites miocenicus* Kozhantchikov, 1957.

Comment: This genus was originally designated to accommodate noctuids of uncertain association. The family Noctuidae has now been restricted largely to the trifine subfamilies by Zahiri *et al.* (2010). This necessitates revision of the original concept of *Noctuites*. Most noctuoid fossils are incomplete, making them hard to place in a modern phylogeny of Noctuoidea. We suggest redefining the genus *Noctuites* to include noctuoids whose further association cannot be determined. Since our redefinition does not conflict with the subsequent type designation by Nye (1975), we retain *Noctuites haidingeri* Heer as the type species of the genus.

caucasicus Kozlov, 1988: 45, fig. 10, pl. 3: 1 (*Noctuites*).

CI (adult: forewing)/PIRAS (HT: PIN 254/175)/Russia: Stavropol Territory, 18 km to the west of Stavropol, Vishnevaya Balka, Cherry Ravine (Karagan horizon)/Langhian, Middle Miocene.

deperditus Heer, 1856: 30, pl. 2: 8 (*Noctuites*); Kozlov, 1988: 54 (*incertae sedis*).

CI (adult: whole body)/PMUZ (HT)/France: Bouches-du-Rhone, Aix-en-Provence ("laminites lacustres")/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).

effosus Heer, 1849: 185, pl. 14: 10 (*Noctuites*); Carpenter, 1992: 380 (*incertae sedis*).

= *Noctuites effossus* [sic]; Handlirsch, 1908: 924.

CI (adult: forewing)/originally stated as "k.k. montanistischen Sammlung zu Wien [possibly now GSAV]" (HT: [GSAV or lost?: not found in an inventory by J.-C. Sohn at GSAV])/Croatia: Calicia, Radoboj (Brown Coal deposit, lignite)/Burdigalian, Early Miocene (Rasnitsyn and Zherikhin, 2002).

gersdorfi Kernbach, 1967: 107, fig. 9 (*Noctuites*); Carpenter, 1992: 380 (*incertae sedis*).

CI (adult: wings)/GPUG (HT: 596-8; PT: 596-9)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).

haidingeri Heer, 1849: 185, pl. 14: 9 (*Noctuites*).

CI (adult: forewing)/NHMG (HT: UMJG and P 77562)/Croatia: Calicia, Radoboj (Brown Coal deposit, lignite)/Burdigalian, Early Miocene (Rasnitsyn and Zherikhin, 2002).

incertissimus Oustalet, 1870: 158, pl. 1: 18 (*Noctuites*); Kozlov, 1988: 55 (*incertae sedis*).

CI (adult: whole body)/originally private collection, M. Lecoq [possibly at MNHN or lost]/France: Cantal, Puy-de-Dôme, ?Gergovia/Chattian, Late Oligocene.

kaspievi Kozlov, 1988: 46, fig. 11, pl. 3: 2 (*Noctuites*).

CI (adult: partial forewing)/PIRAS (HT: PIN 254/2057)/Russia: Stavropol Territory, 18 km west of Stavropol, Vishnevaya Balka, Cherry Ravine (Karagan horizon)/Langhian, Middle Miocene.

kozhantshikovi Kozlov, 1988: 47, fig. 13, pl. 3: 4–5 (*Noctuites*).

CI (adult: partial forewing)/PIRAS (HT: PIN 254/166)/Russia: Stavropol Territory, 18 km west of Stavropol, Vishnevaya Balka, Cherry Ravine (Chokraksky horizon)/Middle Miocene.

kusnezovi Kozlov, 1988: 47, fig. 12, pl. 3: 3 (*Noctuites*).

CI (adult: partial forewing)/PIRAS (HT: PIN 254/1912)/Russia: Stavropol Territory, 18 km west of Stavropol, Vishnevaya Balka, Cherry Ravine (Chokraksky horizon)/Middle Miocene.

maximus Kozlov, 1988: 47, fig. 14, pl. 4: 2–3 (*Noctuites*).

CI (adult: partial forewing)/PIRAS (HT: PIN 254/178)/Russia: Stavropol Territory, 18 km west of Stavropol, Vishnevaya Balka, Cherry Ravine (Chokraksky horizon)/Middle Miocene.

miocenicus Kozhanchikov, 1957: 676, fig. 2 (*Xyleutites*); Kozlov, 1988: 47, fig. 15, pl. 4: 1 (*Noctuites*).

CI (adult: forewing)/PIRAS (HT: 254/182)/Russia: Stavropol, Vishnevaya Balka, Cherry Ravine (unknown horizon)/Tortonian, Late Miocene.

radobojana Kozlov, 1988: 48 (*Noctuites*).
= (Noctuidae) *radobojana* Handlirsch, 1908: 924. Nomen nudum [non-binominal (Kozlov, 1988: 48)].
CI (adult: forewing)/originally stated as "Wiener Hofmuseum [now NHMW]" (HT: [NHMW or lost?: not found in an inventory by J.-C. Sohn at NHMW])/Croatia: Calicia, Radoboj (Brown Coal deposit, lignite)/Burdigalian, Early Miocene (Rasnitsyn and Zherikhin, 2002).

stavropolicus Kozlov, 1988: 48, fig. 16, pl. 4: 4 (*Noctuites*).
CI (adult: partial forewing)/PIRAS (HT: PIN 254/185)/Russia: Stavropol Territory, 18 km west of Stavropol, Temnolessky village (Chokraksky horizon)/Middle Miocene.

—Hope, 1836: 146 (*Noctua*). **comb. nov.**
AM (not stated)/not stated/not stated/not stated.
Comment: It is unlikely that the author was referring specifically to the genus *Noctua* as currently defined. Rather, he applied *Noctua* as a collective name for noctuids, making it equivalent to *Noctuites*. For this reason, we treat this fossil under *Noctuites*.

—Kozlov, 1988: 48, fig. 17, pl. 4: 5 (*Noctuites*).
CI (adult: body)/PIRAS (1 ex: PIN 254/201)/Russia: Stavropol Territory, 18 km to the west of Stavropol, Temnolessky village (Chokraksky horizon)/Middle Miocene.

—Lomnicki, 1894: 99, pl. 9: 81 (*Noctua*). **comb. nov.**
AS (adult: wing)/LNHM (1 ex)/Ukraine: L'viv, 1.5 miles SE of Drohobycz, Boryslawia [= Boryslav] (unconsolidated tar sands)/Pleistocene.
Comment: It is unlikely that the author was referring specifically to the genus *Noctua* as currently defined. Rather, Lomnicki applied *Noctua* as a collective name for noctuids, making it equivalent to *Noctuites*. For this reason, we treat this fossil under *Noctuites*.

GENUS *incertae sedis*

—Bonde *et al.*, 2008: 143 (Noctuidae).
CI (adult: whole body)/MHMM (1 ex: DK 172)/Denmark: Jutland, Mors Island, Ejerslev Molergrav (Fur Fm.)/late Thanetian, Late Paleocene.

—Curtis, 1829: 295 (?*Phalaena*); Handlirsch, 1908: 927 (uncertain).
CI (adult)/originally Murchison and Lyell's collection [lost?]/France: Bouches-du-Rhone, Aix-en-Provence ("laminites lacustres")/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).

—Douglas and Stockey, 1996:1151, fig. 33 (Noctuidae).
CI (adult: partial hindwing)/UAME (1 ex: no. 4579)/Canada: British Columbia, Quilchena Creek Valley (Allenby Fm.)/Lutetian, Middle Eocene (Mathewes and Brooke, 1971).

—Holst, 1908: 5 (Lepidoptera); Kolbe, 1932: 210; Henriksen, 1933: 213 (Noctuidae spp.)
SR (pupa)/not stated/Sweden: Lund, Toppeladugård, Allerødmuld Glacial (Last glacial interval, unconsolidated sediments)/Late Pleistocene.

—Poinar, 1992: 287 (Noctuidae).
AM (not stated)/not stated/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

—Reiss, 1936: 554 (Noctuidae).
CI (not stated)/SMNS (1 ex: Nr. 43951)/Germany: Baden–Württemberg, Esslingen, Randecker Maar ("dysodile beds")/Burdigalian, Early Miocene.

—Scudder, 1867: 117 (Noctuidae); Scudder, 1877: 765 (Diptera, *Eristalis lapideus*); Kozlov, 1988: 54 (Noctuidae).
CI (adult)/originally private collection, William Denton [now ?MCZH]/USA: Wyoming, Sweetwater Co., Green River (Green River Fm.)/early Lutetian, Middle Eocene.

—Théobald, 1937: 163, pl. 3: 20 (Noctuidae); Leestmans, 1983: 81, fig. 21.
CI (adult: whole body)/NHMB (1 ex: R. 827)/Germany: Baden–Württemberg, Kleinkems ("Plattiger Steinmergel")/late Chattian, Late Oligocene.

Questionably placed in Noctuoidea

Genus *incertae sedis*

—Bachofen-Echt, 1949: 150 (*Triphaena*); Skalski, 1990c: 164 [in table] (Noctuidae).
AM (not stated)/not stated [?BPGM: not found in an inventory by J.-C. Sohn at BPGM])/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.
Comment: It is also possible that the author incorrectly cited Gervais (1877). Skalski (1990) simply listed Noctuidae from Baltic amber. It is likely that he cited Bachofen-Echt's record.

—Gall and Tiffney, 1983: 507, figs. 1a–c, f (Noctuidae); Whalley, 1986: 257 (?Noctuidae); Kozlov, 1988: 48 (*Noctuites*).
SI (egg)/PMNH/USA: Massachusetts, Martha's Vineyard, Gay Head (Magothy Fm.)/Campanian, Late Cretaceous.
Comment: If correctly identified, this fossil might be the earliest fossil evidence of Noctuoidea and the encompassing Macroheterocera. Kristensen and Skalski (1998: 20–21), however, strongly doubted the noctuid origin of the fossil eggs, which show only phenetic similarities, not diagnostic autapomorphies, with extant noctuid eggs.

—Gervais, 1877: 68 (maybe *Triphaena*); Kozlov, 1988: 57 (uncertain).
SI (pupa)/not stated [probably MNHN, if not lost]/France: Lot, Quercy (Phosphorites Fm.)/early Chattian, Late Oligocene (Wolsan and Lange-Berdé, 1996).

—Nuorteva and Kinnunen, 2008: 119, fig. 12 (Noctuidae).
AM and T (larval frass)/FMUH (1 ex: no. 5640)/Lithuania: Klaipedos, Palanga (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.
Comment: The authors likened the fossil to frass produced by the larvae of *Panolis flammea* (Noctuidae).

2. Lepidoptera *incertae sedis*

This section includes lepidopteran fossils whose taxonomic placement is uncertain due to their incomplete preservation or the lack of taxonomic study.

CHIONAEMOPSIS Cockerell and LeVeque, 1931: 354 (uncertain); Forbes, 1931: 479 (Attevidae); Kozlov, 1988: 53–54 (?Oecophoridae); Carpenter, 1992: 380 (?Yponomeutidae).
Type species: *Chionaemopsis quadrifasciatus* Cockerell and LeVeque, 1931.

quadrifasciatus Cockerell and LeVeque, 1931: 355 (*Chionaemopsis*).
CI (adult: partial forewing)/Henderson and Byram Collection [?UCNH]/USA: Colorado, Garfield Co., Piceance Creek Basin, Parachute Creek (Green River Fm.)/early Lutetian, Middle Eocene.

PHALAENA auct Bloch, 1776 (?Geometridae) (nec Linnaeus, 1758 [suppressed name]); Kozlov, 1988: 55 (uncertain).

geometra Bloch, 1776: 180 (*Phalaena*).
CO? (adult: whole body)/not traced (see Dunlop and Jekel, 2008 for details), only original drawing available/origin uncertain (see Dunlop and Jekel, 2008 for details)/uncertain.

PHYLLEDESTES Cockerell, 1907a: 188 (?Nymphalidae); Kozlov, 1988: 55 (uncertain); Meyer, 2003: 165 (?Noctuidae).
Type species: *Phylledestes vorax* Cockerell, 1907.

vorax Cockerell, 1907a: 188, fig. 9 (*Phylledeste*); Meyer, 2003: 165, fig. 198.
CI (larva: whole body)/UCNH (HT: no. 4608)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.

cf. *TINEA* auct Presl, 1822 (nec Linnaeus, 1758 [extant]).

antiqua Presl, 1822: 199 (?*Tinea*).
AM (adult: whole body)/not traced (see Dunlop and Jekel, 2008)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.
Comment: The author likened this fossil to *Lithosia* [Erebiidae: Arctiinae] and *Tinea* [Tineidae], two very different moth genera. It is impossible to discern its true identity from the short original description. It is very unlikely to be related to *Tinea* as currently defined, given that at the time of the original description, *Tinea* encompassed most microlepidopterans.

GENUS *incertae sedis*

—Alonso *et al.*, 2000: 171, fig. 10: 5 (Lepidoptera).
AM (adult: whole body)/ANZM (1 ex: MCNA 8642)/Spain: Basque County, Álava, Peñacerrada (Nograro Fm.)/early Albian, Early Cretaceous.

—Ansorge, 1996: 69, pl. 13: 6–7 (Lepidoptera).
CI (adult: forewing)/MNHU (1ex: LGA 968)/Germany: Mecklenburg, Grimmen ("Grüne Serie")/early Toarcian, Early Jurassic.

—Ansorge and Kohring, 1995: 83, fig. 3 (Lepidoptera).
CI (pupa: whole body)/SMNH (1 ex)/Germany: Baden–Württemberg, Esslingen, Randecker Maar ("dysodile beds")/Burdigalian, Early Miocene.

—Archibald, 1995: fig. 3 (Lepidoptera).
CI (larva: whole body)/not stated/Canada: British Columbia, Okanagan Highlands, Horsefly River/Ypresian, Early Eocene (Archibald and Makarkin, 2006).

—Archibald, 1995: fig. 4 (Lepidoptera).
CI (adult: forewing)/not stated/Canada: British Columbia, Princeton Chert (Allenby Fm.)/Lutetian, Middle Eocene (Mathewes and Brooke, 1971).

—Bennike and Bøcher, 1990: 337 (gen. and sp. indet.).
SR (not stated)/NHMD/Denmark: Greenland, NE Peary Land (Kap København Fm.)/Gelasian, Late Pliocene–Early Pleistocene boundary.

—D'Abrera, 2001: 65 (moth in amber)
AM (adult: whole body)/not stated/not stated/not stated.

—Davis, 1989: 549 (Lepidoptera).
AM (not stated)/USNM/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.
—Evers, 1907: 129 (Lepidoptera) [multiple species].
CO (adult and larva: whole body)/PJEH (6 ex)/not stated/not stated.

—FIRGNE, 1990: 106, fig. 10.5 (Lepidoptera).
SR (pupa)/not stated [?OMNH] (197 ex)/Japan: Nagano Pref., Ikejiri-gawa Hollow, Hill Site excavation site (Nojiri-ko Fm.)/Late Pleistocene.

—Mueller, 1964: 22 (lepidopteran wing scales); Frey, 1964: 70.
SR (adult: wing scales)/not stated [?GBIU]/USA: Indiana, Kosciusko Co., Winona Lake and Wyland Lake; Marshall Co., Lawrence Lake (Last Glacial Maximum, unconsolidated sediments)/Late Pleistocene.

—Fujiyama, 1983a: 85 (Lepidoptera).
CI (not stated)/NSMT (1 ex)/Japan: Yamakata Pref., Kamiwada (Wada Fm.)/Late Miocene.

—Fujiyama, 1983a: 85 (Lepidoptera).
CI (not stated)/NSMT (1 ex)/Japan: Akita Pref., Sanzukawa/Late Miocene.

—Gelhaus and Johnson, 1996: 63 (Lepidoptera).
AM (not stated)/ANSP (1 ex)/USA: New Jersey, Middlesex Co., Sayreville (New Jersey Amber, Raritan Fm.)/Turonian, Late Cretaceous.

—Gentilini, 1991: 62 (Lepidoptera).
CI (adult: wings)/not stated [?MTRE]/Italy: Marche, Monte Castellaro ("Gessoso-Solfifera" Fm.)/early Messinian, Late Miocene.

—George, 1952: 100, fig. 56 (?microlepidoptera).
CI (pupa: antennal sheath)/SJCA (1 ex: slide no. 15)/India: Maharashtra, Nagpur, near Takli village, Seminary Hills (Takli Fm.)/Maastrichtian–Danian, Late Cretaceous–Early Paleocene interval (Sahni, 1984).

—Gravenhorst, 1835: 92 (*Tinea*).
AM (adult)/not stated (part of ca. 40 ex: [lost?])/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.
Comment: The author likened the fossil to two extant species, *Chrysoteuchia culmella* (= *Tinea culmella*: Crambidae) and *Tinea pellionella* (Tineidae).

—Gravenhorst, 1835: 92 (Lepidoptera) [multiple species].
AM (adult?)/not stated (ca. 40 ex: [lost?])/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Grimaldi and Engel, 2005: 52, fig. 2: 20 (Lepidoptera).
CI and T (leaf mine)/MVVA (1 ex: VM180365)/Australia: Victoria, Alcoa Anglesea Coal Mine, S38°25′ E144°11′ (Eastern View Fm.)/Priabonian, Late Eocene.

—Grimaldi and Nascimbene, 2010: 180, figs. 10d–f (Lepidoptera) [multiple species].
AM (adult: whole body)/not stated [?AMNH] (3 ex)/USA: New Jersey, Middlesex Co., Sayreville (New Jersey Amber, Raritan Fm.)/Turonian, Late Cretaceous.

—Grimaldi *et al.*, 2000: 16, 26 [in table] (Lepidoptera) [multiple species].
AM (various)/AMNH (17 ex)/USA: New Jersey, Middlesex Co., Sayreville (New Jersey Amber, Raritan Fm.)/Turonian, Late Cretaceous.
Comment: Some of these fossils may be identical to ones depicted in Grimaldi and Engel (2005).

—Grimaldi *et al.*, 2002: 11 (Lepidoptera) [multiple species].
AM (not stated)/AMNH (3 ex)/Myanmar: Kachin Prov., Hukawang Valley (Burmese Amber, "channel facies" of an unnamed formation)/late Aptian, Early Cretaceous.

—Grote, 1901: 108 (microlepidoptera); Kuznesov, 1941: 69 (*incertae sedis*).
CO (adult: not stated)/RPMH (1 ex)/Tanzania: Zanzibar Island (East African Copal, unconsolidated sediments)/Late Pleistocene.

—Grote, 1901: 108; Kusnezov, 1941: 69 (*incertae sedis*).
CO (pupa in cocoon)/RPMH (1 ex)/Tanzania: Zanzibar Island (East African Copal, unconsolidated sediments)/Late Pleistocene.

—Grote, 1901: 108 (Tineidae); Kusnezov, 1941: 69 (microlepidoptera).
CO (adult: whole body)/RPMH (1 ex)/Tanzania: Zanzibar Island (East African Copal, unconsolidated sediments)/Late Pleistocene.

—Haase, 1890: 26 ("Saniden"); Handlirsch, 1908: 628.
CI (not stated)/Dr. A. Assmann Collection [now ?NHUW]/not stated/not stated.

—Hand *et al.*, 2010: 76 ("two moths").
AM (not stated)/not stated/Australia: northern Queensland, Cape York Peninsula (Cape York Amber, lignite)/stage unknown, probably Middle Miocene (Godthelp *et al.* 2010).

—Handschin, 1944: 8–9, figs. 10, 11, pl. 1: 8–10 (Tineidarum) [multiple species?].
SI (larva: partial body; pupa)/NHMB/France: Lot, Quercy (Phosphorites Fm.)/early Chattian, Late Oligocene (Wolsan and Lange-Berdé, 1996).

—Hayashi *et al.*, 2002: 168 [in table 1] (Lepidoptera).
SR (pupa)/LBMS (4 ex)/Japan: Kyushu, Kagoshima Pref., Yoshimatsu-cho (Mizozono Fm.)/Late Pleistocene.

—Hayashi *et al.*, 2004: 64 [in table 1] (Lepidoptera).
SR (pupa)/LBMS (1 ex)/Japan: Kyushu, Kumamoto Pref., Mashiki, Shimojin, Kanayama River (Tsumori Fm.)/Middle Pleistocene.

—Hayashi *et al.*, 2005: 229 [in table 1] (Lepidoptera).
SR (pupa)/LBMS (1 ex)/Japan: Kyushu, Oita Pref., Kitsuki City, Beppu Bay (Hirabaru Fm.)/Middle Pleistocene.

—Hayashi *et al.*, 2008: 91 [in table 1] (Lepidoptera).
SR (pupa)/LBMS (13 ex)/Japan: Honshu, southern Hiroshima Pref., Higashi-Hiroshima City, Saijo and Kurose Basins (Saijo Fm.)/Middle Pleistocene.

—Hayashi *et al.*, 2009: 106 [in table 1] (Lepidoptera).
SR (pupa)/LBMS (6 ex)/Japan: Kyushu, Oita Pref., Kokonoe (Nogami Fm.)/Middle Pleistocene.

—Helm, 1899: 38 (microlepidoptera); Handlirsch, 1908: 928 (uncertain).
AM (not stated)/originally in Conwentz Collection (1 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Henriksen, 1922: 19 (Lepidoptera) [possibly one species].
CI (adult: not stated)/NHMD (4 ex)/Denmark: northern Jutland, western Limfjorden, Hanklit and Silstrup (Fur Fm.)/Thanetian, Late Paleocene–Early Eocene.

—Henrotay, 1986: 272 (Lepidoptera) [multiple species].
CI (not stated)/private collection, Michel Henrotay (7 ex)/France: Alpes-de-Haute-Provence, Dauphin ("laminites lacustres")/Rupelian, Early Oligocene.

—Hoffeins and Hoffeins, 2003: 385 [in table 3] (Lepidoptera) [multiple species].
AM (various)/private collection, Christel and Hans Werner Hoffeins, Hamburg, Germany (23 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Hoffeins and Hoffeins, 2003: 385 [in table 3] (Lepidoptera) [multiple species].
AM (various)/private collection, Christel and Hans Werner Hoffeins, Hamburg, Germany (70 ex)/Germany: Tagebau Goitsche, Bitterfeld Coal Mine (Saxonian Amber, Cottbus Fm.)/Lutetian, Middle Eocene.

—Hope, 1836: 146 ("*Tinea,*" 4 spp.).
CO (not stated)/Hope collection [?OUNH: not found in an inventory by J.-C. Sohn at OUNH] (4 ex)/not stated/not stated.

—Hurd and Smith, 1957: 7 ("moths").
AM (not stated)/not stated/Mexico: Chiapas, Simojovel (Mexican Amber, Simojovel Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

—Jarzembowski, 1976: 12 ("small moth").
CI (not stated)/BMNH (1 ex)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.
Comment: This fossil could be one of the Lepidoptera later described by Jarzembowski (1980).

—Jarzembowski, 1980: 272 (species D).
CI (adult: abdomen and partial wings)/BMNH (1 ex: In.17392)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

—Jarzembowski, 1980: 272 (species E).
CI (adult: body and partial forewing)/BMNH (1 ex: In.25251)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

—Jarzembowski, 1980: 272 (species F).
CI (adult: partial body and wings)/BMNH (1 ex: In.9783)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

—Jarzembowski, 1980: 272, fig. 63 (species G).
CI (adult: body and partial forewing)/BMNH (1 ex: In.8917)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

—Jarzembowski, 1980: 274 (species I).
CI (adult: partial body and wings)/BMNH (1 ex: In.64541)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

—Jarzembowski, 1980: 274 (species J).
CI (adult: partial body and wings)/BMNH (1 ex: In.25157)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

—Jarzembowski, 1980: 275, fig. 65 (species L).
CI (adult: partial body and wings)/BMNH (1 ex: In.24506/64543)/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

—Joseph, 1986: 1 (Lepidoptera); Lewis, 1992: 15, 16 [multiple species].
CI (various)/TBMM or CSUM/USA: Washington State, Ferry Co., Republic (Klondike Mountain Fm.)/early Lutetian, Middle Eocene (Pearson and Obradovich, 1977).

—Kernbach, 1967: 103, fig. 1 (Lepidoptera) [multiple species].
CI (larva: whole body)/GPUG (16 ex: 596-13 etc.)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).

—Kernbach, 1967: 103, 106 (Kleinschmetterlinge [= microlepidoptera]) [multiple species].
CI (adult)/GPUG (2 ex)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).

—Kernbach, 1967: 103 (Großschmetterlinge [= macrolepidoptera]) [multiple species].
CI (adult)/GPUG (5 ex)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).
Comment: The author initially mentioned 10 specimens of macrolepidopteran fossils, and subsequently mentioned five specimens of Rhopalocera fossils. We assume that the latter are a part of the ten, so count only five non-Rhopaloceran fossils here.

—Klebs, 1890: 270 (Lepidoptera) [multiple species].
AM (not stated)/?AMKR (ca. 1000 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.
Comment: The author mentioned that this collection includes almost 1000 specimens. It is very likely that some of these fossils have been described by subsequent researchers. It is, however, impossible to differentiate the described fossils. We therefore retain the stated original number of specimens.

—Knowlton, 1917: 80, pl. 35: 5 (Lepidoptera).
= "fruiting stage parasitic body [?fungus] or insect eggs"; Hall, 1845: 166, pl. 2: 5b, 5c.
CI (egg mass)/USNM [not found in an inventory by J.-C. Sohn at USNM]/USA: Wyoming, Lincoln County, Cumberland (Frontier Fm.)/Turonian, Late Cretaceous.

—Koponen and Nuorteva, 1973: 21, 34 (Lepidoptera) [multiple species].
PE (various)/LFUF/Finland: Hochmoor, Piionsuo Moor (peat deposits)/Pleistocene.

—Kosmowska-Ceranowicz, 1996: 59 ("larwa motyla").
AM (larva)/LNHM (1 ex: no. 194)/Poland: Lvov, Gdansk (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Kozlov, 1988: 22, pl. 1: 1, 2 (Larva *incertae sedis* no. 1 and 2) [multiple species].
CI (larva)/PIRAS (2 ex: PIN 3429/326; PIN 3429/328)/Russia: Primorsky Krai, Pozharsky District, Bol'shaya, upper reaches of Burachek River, near the Svetlovodnaya River ("lake diatomites")/?Late Oligocene (Rasnitsyn, 1986).

—Kozlov, 1988: 23, pl. 1: 3 (Lepidoptera).
CI (pupa)/PIRAS (1 ex: PIN 3122/1)/Kazakhstan: Chelkarsky District, Aktyubinsky Province, ravine at 3km E to the NE of Sandal/Oligocene.

—Krassilov, 2007: 15, fig.1; Krassilov and Shuklina, 2008: 243, fig. 5 (lepidopteran leaf mines) [multiple species]
CI and T (leaf mine)/IEUH (> 3 ex: IG1-1; IG1-45; IG1-139; etc.)/Israel: Negev Desert, central Negev, Makhtesh Ramon (Upper Hatira Fm.); Negev Desert, southern Negev, Arava Valley (Ora Fm.)/Albian–Turonian, Late Cretaceous.

Fossil plant host: Myrtales —*Paltydebeya papilionacea* Krassilov; etc.

—Kupryjanowicz, 2001: 62 (Lepidoptera) [multiple species].
AM (adult)/MEPA (19 ex: no. 4756; no. 5760; no. 11452; no. 14154; no. 14941; no. 15508; no. 15511; no. 15512; no. 15839; no. 17444; no. 17863; no. 18120; no. 18878; no. 19961; no. 20900; no. 20177; no. 5604 [lost]; no. 5765 [lost]; no. 15690 [lost])/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Kupryjanowicz, 2001: 62, fig. 79 (Lepidoptera).
AM (larva)/MEPA (1 ex: no. 13881)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Lancucka-Srodoniowa, 1964: 471–472, fig. 6 (lepidopteran coprolite).
= Order? Fruit; Reid and Reid, 1915: 124, pl 14: 31.
SI and T (coprolite)/GBNM (1 ex)/Netherlands: Limburg Prov., Reuver (Kieseloölite Fm.)/Gelasian, Late Pliocene–Early Pleistocene boundary (Kemna, 2008).

—Lancucka-Srodoniowa, 1964: 471–472, fig. 1 (lepidopteran coprolite).
= ?*Aralia racemosa* Fruit ; Reid and Reid, 1915: 124, pl. 14: 26.
SI and T (coprolite)/GBNM (1 ex)/Netherlands: Swalmen/Late Pliocene (Gregor, 1990).

—Lancucka-Srodoniowa, 1964: 471–472, figs. 13–14 (lepidopteran coprolite).
= *Carpolithus* sp. 1; Chandler, 1926: 44, pl. 7: 11a, b.
= *Carpolithus* sp., Fruit; Chandler, 1961: 155, pl. 30: 154–156.
SI and T (coprolite)/BMNH (4 ex: V42229; V42230; V42231; one specimen destroyed)/United Kingdom: S Hampshire, Isle of Wight, Headon Beds (Headon Hill Fm.)/Oligocene.

—Lancucka-Srodoniowa, 1964: 471, figs. 4–5 (lepidopteran coprolite).
= *Aralia* sp., Fruit; Szafer, 1947: 157, pl. 7: 21–22.
SI and T (coprolite)/WSIB (part of 22 ex)/Poland: Krościenko/Pliocene.

—Lancucka-Srodoniowa, 1964: 471, figs. 7–8 (lepidopteran coprolite).
= Araliaceae, Fruit; Szafer, 1954: 52, pl. 13: 21–22.
SI and T (coprolite)/WSIB (1 ex)/Poland: Krakow, Mizerna, Western Carpathians/Pliocene.

—Lancucka-Srodoniowa, 1964: 471, figs. 9–12 (lepidopteran coprolite).
= *Aralia* aff. *chinensis* L., Fruit; Szafer, 1961: 78, pl. 21: 1–3.
SI and T (coprolite)/WSIB (20 ex [in part?])/Poland: Upper Silesia, Stare Gliwice (Sarmatian deposit)/Messinian, Late Miocene (Worobiec, 2007).

—Lang *et al.*, 1995: 162, fig. 4a, pl. 3: 5 (lepidopteran mine).
CI and T (leaf mine)/BMNH (1 ex: V. 50089)/United Kingdom: Hampshire, East Dorset, Bournemouth (Branksome Sand Fm.)/Lutetian, Middle Eocene (McElwaine, 1998).
Comment: The authors stated that the fossil mine is similar to mines made by extant *Stigmella* or *Bedellia* larvae. It is not clear, however, that they intended to link the fossils taxonomically with any extant species (see Lang *et al.* 1995 for the analog modern taxa).

—Larsson, 1962: 324, 326 (Lepidoptera); Larsson, 1965: 140; Larsson, 1978: 187 [multiple species].
AM (adult and larva)/NHMD (58 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Leestmans, 1983: 72, fig. 17 (Lepidoptera).
CI (adult: whole body)/ENSM (lost)/France: Bouches-du-Rhone, Aix-en-Provence (“laminites lacustres”)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).
Comment: Only a photo taken by Théobald in 1935 is known for this specimen.

—Lemdahl, 2000: 307, fig. 2, tbl. 3 (Lepidoptera) [multiple species].
SR (not stated)/BTVU/Switzerland: Bern, Gerzensee (Late Glacial Maximum, unconsolidated sediments)/Younger Dryas, Early Holocene.

—Lewis, 1989: 5–6 (Lepidoptera).
CI (not stated)/not stated/USA: Nevada, SW Mineral County, Hawthorn, Stewart Valley Fossil Beds (Savage Canyon Fm.)/Serravalian, Middle Miocene (Perkins *et al.*, 1998).

—Martínez-Delclós *et al.*, 2004: fig. 3g
CO (adult: whole body)/EPGM (1 ex)/Madagascar (copal stalactite)/Holocene.

—McCobb *et al.*, 1998: 555, fig. 3 (Lepidoptera) [multiple species].
CI (not stated)/MMAG/United Kingdom: England, Isle of Wight, Bembridge Marls (Bouldnor Fm.)/late Priabonian, Late Eocene.

—Miki, 1937: 305, Fig. 10p (caterpillar excrement); Lancucka-Srodoniowa, 1964: 471–472, figs. 17–19.
SI and T (coprolite)/not stated/Japan: Seto Naikai, Taniyagi-Higashiei (Stegodon Beds)/Pliocene.

—Minot, 1886: 46–47 (lepidopteran larvae).
CI (larva)/originally in Scudder's possession (2 ex: no. 16383 etc.)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.
Comment: This record was based on the author's personal communication with Scudder who identified the fossil.

—Moran and Matthews, 1983: 152 [in table] (Lepidoptera, undetermined).
SR (not stated)/UAME (not stated)/Canada: Northern Yukon Territory, Old Crow Basin, CRH-15 (77-51 lacustrine unit)/Middle–Late Pleistocene.

—Nel and Nel, 1985: 126, figs. 13–15 (undetermined larvae).
CI (larva: whole body)/private collection, André and Jacques Nel, á La Ciotat, France (3 ex)/France: Bouches-du-Rhone, Aix-en-Provence ("laminites lacustres")/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).

—Nel and Nel, 1985: 126, 128, figs. 16–17 (Lepidoptera).
CI (pupa)/private collection, André and Jacques Nel, á La Ciotat, France (1 ex: no. 343)/France: Eguilles Prov., Aix/Rupelian, Early Oligocene.

—Nel and Nel, 1985: 126, 128, figs. 18–19 (Lepidoptera).
CI (Pupa)/private collection, André and Jacques Nel, á La Ciotat, France (1 ex: no. 140)/France: Alpes-de-Haute-Provence, Céreste, Luberon ("Calcaires de Montfuron" or "Calcaires de Vachères")/Early Oligocene.

—Néraudeau *et al.*, 2002: 237, figs. 4–5 (Lepidoptera).
AM (not stated)/MNHN/France: Charente-Maritime, Archingeay (French Amber, Subunit Als 12 in "sandy, lignitic clay")/Late Albian, Early Cretaceous.

—Nudds and Selden, 2008: 249, fig. 273 (Lepidoptera).
AM (adult: whole body)/private collection with no detail (1 ex)/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

—Peñalver, 1997: 32, fig. 3 (Lepidoptera) [multiple species].
CI and T (feeding mark)/MCNV (5 ex: 2234a-RM; 235a-RM; 2236a-RM; 2233a-RM; 2237-RM)/Spain: Teruel Prov., Rubielos de Mora, "Alto de la Venta" locality ("bituminous rhythmites")/Burdigalian, Early Miocene.

Fossil plant host: Myricaceae —*Myrica banksiaefolia* Unger; *Myrica* sp.; Salicaceae —*Salix cascadensis* Cockerell (= *tenera* Andersson).

—Peñalver and Delclòs, 2004: 80, 82, fig. 6: 1, pl. 2: 1 (Lepidoptera).
CI and T (leaf mine)/MPMV (1 ex: RIBES-81)/Spain: Castellón Prov., near Ribesalbes, "La Rinconada" locality (Izarra Fm.)/Burdigalian, Early Miocene.
Fossil plant host: ?Cannabaceae —?*Celtis*.

—Poinar and Poinar, 2005: 249, figs. 23–24 (lepidopteran caterpillar with tumors).
AM (larva: whole body)/AIOSU (1 ex)/Mexico: Chiapas, Simojovel (Mexican Amber, Simojovel Fm.)/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary.

—Pongrácz, 1928: 152 (Psychidae); Kozlov, 1988: 55 (uncertain).
CI (adult: whole body)/HNHM (1 ex)/Croatia: Calicia, Radoboj (Brown Coal deposit, lignite)/Burdigalian, Early Miocene (Rasnitsyn and Zherikhin, 2002).

—Procaccini, 1842: 449 (Lepidoptera); Handlirsch, 1908: 928 (uncertain).
CI (adult: whole body)/not stated/Italy: Sinigaglia/Late Miocene.
Comment: A short description by the original author states that the fossil has "scaled wings," which suggests that it is a lepidopteran.

—Prokop, 2003: 335 [in table] (Lepidoptera).
CI (adult: fragmentary body and wing)/SMMG/Czech Republic: Krusne hory Piedmont Basin, Ceske stredohori Mts. (Strezov Fm.)/Rupelian, Early Oligocene.

—Raffray, 1875: 126 (microlepidoptera).
CO (not stated)/not stated (1 ex)/Tanzania: Zanzibar Island (East African Copal, unconsolidated sediments)/Late Pleistocene.

—Rasnitsyn and Ross, 2000: 24 (Lepidoptera) [multiple species].
AM (adult: whole body)/BMNH (3 ex: In.19123; In.20151; In.20172)/Myanmar: Kachin Prov., Hukawang Valley (Burmese Amber, "channel facies")/late Aptian, Early Cretaceous.

—Rebel, 1934b: 372 (microlepidoptera).
AM (not stated)/originally in Klebs collection [?AMKR] (1 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Ross, 1998: 24, fig. 66 (Lepidoptera).
AM (larva: shed skin)/BMNH (1 ex)/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

—Ross, 1998: 54, fig. 129 (Lepidoptera).
AM (adult: whole body)/BMNH (1 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Ross, 1998: 54, fig. 130 (Lepidoptera).
AM (larva: whole body)/MMAG (1 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Rozefelds, 1988a: 2, figs. 2a–d (lepidopteran mines) [multiple species].
CI and T (leaf mine)/MVVA (2 ex: MV P183063; MV P183064)/Australia: Victoria, Alcoa Anglesea Coal Mine, S38°25′ E144°11′ (Eastern View Fm.)/Priabonian, Late Eocene.

—Rust, 1998a: 54–57, figs. 9–10 (Lepidoptera) [multiple species].
CI (adult: whole body)/MHMM (3 ex: HM 14M-C2005; HM 14M-A2845; HM 14-B2673) and private collection, Bent Søe Mikkelsen, Denmark (BSM I 239)/Denmark: Jutland, Mors Island (Fur Fm.)/late Thanetian, Late Paleocene.

—Rust, 1998b:136, 138; 2000: 578, fig. 1 (Lepidoptera); Rust, 2000a: 530 [multiple species].

CI (adult)/not specified (ca. 1,750 ex)/Denmark: NW Jutland, western Limfjord area, Mo-clay (Fur and Olst Fms.)/late Thanetian, Late Paleocene.

—Rust, 1999: 351, pl. 28: c (Lepidoptera gen. et sp. indet. 1).

CI (adult: whole body)/MHMM (3 ex: MM 5-B2559; I311; I521) and private collection, Mr. Erwin Rettig, Nykøbing, Mors, Limfjord, Denmark (now ?NHMD, 1 ex: ERK FLA96 F13)/Denmark: Jutland, Mors Island (Fur Fm.)/late Thanetian, Late Paleocene.

—Rust, 1999: 351, pl. 28: d (Lepidoptera gen. et sp. indet. 2).

CI (adult: whole body)/MHMM (4 ex: MM 14M-B4034; I1877; I2838; I3542) and private collection, Mr. Erwin Rettig, Nykøbing, Mors, Limfjord, Denmark [now ?NHMD] (2 ex: ERK SA97 K10; KL94 E32)/Denmark: Jutland, Mors Island (Fur Fm.)/late Thanetian, Late Paleocene.

—Rust, 1999: 351, pl. 28: e (Lepidoptera gen. et sp. indet. 3).

CI (adult: whole body)/MHMM (4 ex: MM 12-C2753; 14M-A2975; 14M-C2600; 14M-3842) and private collection, Mr. Erwin Rettig, Nykøbing, Mors, Limfjord, Denmark [now ?NHMD] (1 ex: ERK SV 2A1)/Denmark: Jutland, Mors Island (Fur Fm.)/late Thanetian, Late Paleocene.

—Rust, 1999: 351, pl. 28: f (Lepidoptera gen. et sp. indet. 4).

CI (adult: forewing)/MHMM (4 ex: MM 11-A2465; 11-C3887; 14M-C3847; I1890); private collection, Mr. Erwin Rettig, Nykøbing, Mors, Limfjord, Denmark (now ?NHMD, 1 ex: ERK KL Y6); and GPUG (2 ex: GMUK 1954 95; 1954 543)/Denmark: Jutland, Mors Island (Fur Fm.)/late Thanetian, Late Paleocene.

—Rust, 1999: 351, pl. 29: a (Lepidoptera gen. et sp. indet. 5).

CI (adult: whole body)/GPUG (1 ex: GMUK 1998/24)/Denmark: NW Jutland, western Limfjord area, Mo-clay (Fur and Olst Fms.)/late Thanetian, Late Paleocene.

—Sanderson and Farr, 1960: 1313 (Lepidoptera).

AM (not stated)/not specified [3 institutes mentioned]/Dominican Republic: Palo Alto de la Cumbre, near Pedro Garcia, below Pico Diego de Ocampo/Burdigalian, Early Miocene.

—Scudder, 1881: 290 (Lepidoptera) [multiple species].

CI (adult)/not stated (ca. 12 ex)/USA: Colorado, Teller County, Florissant Beds National Monument (Florissant Fm.)/late Priabonian, Late Eocene.

Comment: The author stated that the collection included butterflies and moths. One fossil moth was identified as Pyralidae or Tortricidae. It is possible that some of these specimens have been described by subsequent researchers, but it is impossible to establish when, where or by whom.

—Sendelius, 1742: 80–90, pl. 2: 19–34, pl. 6: 33–35 (Lepidoptera) [multiple species]

AM (adult: whole body)/not stated [lost?]/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Comment: Only the illustrations are available. From the drawings it appears that at least some of the supposed lepidopteran inclusions are not Lepidoptera (Greven and Wichard 2010).

—de Serres, 1829: 230 (?*Bombyx* or ?*Cossus*); Swinton, 1881: 177, fig. 105 (?*Bombyx*).

CI (adult: head and wings)/MUMF (1 ex)/France: Bouches-du-Rhone, Aix-en-Provence ("laminites lacustres")/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).

—Skalski, 1976a: 162 (Lepidoptera).

AM (pupa)/IPUS/Lebanon: Hammana, Mdeyrij (Lebanese Amber, Grès de Basa Fm. or lateral equivalents)/Hauterivian–Aptian, Early Cretaceous.

Comment: This record originated from the author's personal communication with Dr. Mickoleit.

—Skalski, 1977: 21, fig. 18, pl. 9: 1, pl. 10: 1 (inclusion 3 and 4, two species).
AM (wings and fragmentary legs)/MEPA (2 ex: 24/6 no. 1874/15, 7 MZ/AWS; 54/8 G/20 no. 1945/4, 4 MZ/AWS)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Skalski, 1979a: 90 (Lepidoptera).
AM (adult)/not stated/Canada: Manitoba, Cedar Lake (Canadian amber, Foremost Fm.)/Campanian, Late Cretaceous.
Comment: This record originated from Skalski's personal communication with A. Mutuura.

—Skalski, 1979c: 63 (Lepidoptera).
AM (larva)/not stated/Russia: Siberia, E Taimyr, Taimyr Autonomous Okrug, Chatanga (Taimyr Amber, Kheta Fm.)/Coniacian, Late Cretaceous.

—Skalski, 1979c: 61 (Lepidoptera) [multiple species].
AM (adult: scales or whole body)/not stated/Lebanon: Hammana, Mdeyrij (Lebanese Amber, Grès de Basa Fm. or lateral equivalents)/Hauterivian–Aptian, Early Cretaceous.
Comment: This record originated from Skalski's personal communication with R. Dehm.

—Skalski, 1990c: 164 [in table] (undetermined Lepidoptera).
AM (not stated)/not stated/Romania: Carpathian Mountains (Romanian Amber)/Lutetian, Middle Eocene (Stout *et al.* 2000).

—Smith, 1874: 88 (butterflies) [multiple species].
CI (adult: wings)/not stated/United Kingdom: England, Isle of Wight, Gurnet Bay (Bouldnor Fm.)/late Priabonian, Late Eocene.

—Sohn *et al.*, 2011: 8 (lepidopterans).
CI (adult)/CNUB/China: Inner Mongolia, Ningcheng Co., Wuhua township, near Daohugou (Jiulongshan Fm.)/Bathonian–Callovian, Middle Jurassic.

—Sohn *et al.*, 2011: 8 (lepidopterans).
AM (adult)/various institutes/Baltic Region (Baltic Amber, Prussian Fm.); Germany: Tagebau Goitsche, Bitterfeld Coal Mine (Saxonian Amber, Cottbus Fm.)/Lutetian, Middle Eocene.

—Sontag, 2003: 433 [in table 2], 437 [table 3a] (Lepidoptera) [multiple species].
AM (various)/MPUG (22 ex)/Lithuania: Klaipedos, Palanga (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Stark, 1925: 18 (lepidopteran scales); Frey, 1964: 70.
SR (adult: wing scales)/not stated/Germany: Baden–Württemberg, Wollmattingen, "Heidelmoos" (Last Glacial Maximum, unconsolidated sediments)/Late Pleistocene.

—Leestmans, 1983: 72, figs. 15–16 (Lepidoptera) [multiple species].
CI (adult: whole body)/LGUL (2 ex: lost)/France: Bouches-du-Rhone, Aix-en-Provence ("laminites lacustres")/Chattian–Aquitanian, Late Oligocene–Early Miocene boundary (Rasnitsyn and Zherikhin, 2002).
Comment: Only the photos taken by Théobald in 1935 are extant.

—Théobald, 1937: 132, pl. 1: 6 (Lepidoptera).
CI (adult: whole body)/MVMF (1ex: C42)/France: Gard, Ales, Célas ("lignites")/late Chattian, Late Oligocene.

—Théobald, 1937: 387 (Lepidoptera).
CI (larva)/not specified [3 institutes mentioned] (>10 ex)/France: Alpes-de-Haute-Provence, Céreste ("Calcaires de Montfuron" or "Calcaires de Vachères" Fm.)/Rupelian, Early Oligocene (Heie and Lutz, 2002).

—Weitschat, 2009: 253, fig. 42 (Lepidoptera).
AM (larva and larval case)/DBRD/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Weitschat and Wichard, 1998: 196, pl. 78: a–d (Lepidoptera) [multiple species].
AM (larva: whole body)/RMOD (>4 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Weitschat and Wichard, 1998: 196, pl. 78: e–h (Lepidoptera) [multiple species].
AM (adult: whole body)/RMOD (>4 ex)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Weitschat and Wichard, 1998: pl. 79: e (Lepidoptera).
AM (larva and larval case)/RMOD/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Wilf *et al.*, 2006: 1114, figs. 1c, 1d, 1g, 1h (Lepidoptera) [multiple species].
CI and T (leaf mine)/USNM (> 4 ex: no. 498156; no. 498157; no. 498160; no. 498161 etc.)/USA: SE Montana, Powder River Basin, Mexican Hat locality/Danian, Early Paleocene.
Fossil plant host: Cercidiphyllaceae —*Cercidiphyllum genetrix* (Newberry) Hickey; Juglandaceae —*Juglandiphyllites glabra* Manchester and Dilcher; Platanaceae —*Platanus raynoldsi* Newberry; Trochodendraceae —*Zizyphoides flabella* (Newberry) Crane, Manchester and Dilcher.

—Winkler *et al.*, 2010: 939 (lepidopteran mine).
= *Phytomyzites querci* Givulescu, 1984: 128, pl. 4: 3 (dipteran mine).
CI and T (leaf mine)/IGGB (1 ex: P.25800)/Romania: Maramures Co., Chiuzbaia/Messinian, Late Miocene.
Fossil plant host: Fagaceae —*Quercus* sp.

—Wu, 1997: 77, 191 (Lepidoptera) [multiple species].
AM (adult: whole body)/private collection, Rafael J. C. Wu, Dominica (3 ex: F-471; F-472; F-473)/Dominican Republic: Cordillera Septentrional between Santiago and Puerto Plata, La Toca group of mines (Dominican Amber, La Toca Fm.)/Burdigalian, Early Miocene.

—Zablocki, 1960: 47, fig. 2 (Lepidoptera-caused damage on pine cone); Kozlov, 1988: 24 (uncertain).
SA and T (feeding damage)/GBCU/Poland: Wieliczka, Wieliczka Salt Mine ("spiza" stratified salt deposits)/Langhian–Serravallian, Middle Miocene.
Fossil plant host: Pinaceae —*Pinus kroli* Zablocki.

—Zeuner, 1931: 305, pl. 10: 1a–b (zwei Raupen, spec. indet.).
CI (larva: whole body)/private collection, W. Soergel, Wrocław, Poland (1 ex: Nr. 13/14)/Germany: Baden–Württemberg, Esslingen, Randecker Maar ("dysodile beds")/Burdigalian, Early Miocene.

—Zeuner, 1931: 306–309, pl. 9: 6, 10: 2, 3, 11: 1, 2 (Raupe, spec. indet.).
CI (larva: whole body)/SMNS (5 ex: Nr. 12; Nr. 16; Nr. 17; Nr. 18; Nr. 48)/Germany: Baden–Württemberg, Esslingen, Randecker Maar ("dysodile beds")/Burdigalian, Early Miocene.

—Zherikhin and Sukacheva, 1973: 38 [in table] (Lepidoptera); Skalski, 1976a: 162, fig. 6 (Homoneura); Skalski, 1979c: 63.
AM (adult: forewing)/not stated [?PIRAS] (1 ex)/Russia: Siberia, E Taimyr, Taimyr Autonomous Okrug, Chatanga (Taimyr Amber, Kheta Fm.)/Coniacian, Late Cretaceous.

3. Putative lepidopteran fossils

This section consists of fossils whose lepidopteran association is uncertain or ambiguously stated by the original authors.

—Ash and Hasiotis, 1996: 4; Ash, 1997: 243–244 (damage possibly by orthopterans, coleopterans or lepidopterans).
CI and T (feeding marks)/not stated/USA: Arizona, Navajo Co., Petrified Forest National Park (Chinle Fm.)/late Carnian–early Norian, Late Triassic.
Fossil plant host: Cynepteridaceae —*Cynepteris lasiophora* Ash; Bennetitales —*Zamites* sp.

—Brodie, 1873: 24 (?Lepidoptera).
CI (adult: wings)/not stated [lost?]/United Kingdom: England, Dorset, Purbeck Isle, Portland (Lower Purbeck Fm.)/Tithonian, Late Jurassic (Ensom *et al.* 2009).

—Bromell, 1729: 529 (*Insectorum ovula*); Scudder, 1875b: 1 (not confirmed).
CI (larva?)/not stated [lost?]/Sweden: "saxo foetido, Westrogothia" [near present-day Gothenburg]/?late Paleozoic.

—Bromell, 1729: 528 (*Papilionum majorum*); Scudder, 1875b: 1 (not confirmed).
CI (larva?)/not stated [lost?]/Sweden: "saxo foetido, Westrogothia" [near present-day Gothenburg]/?late Paleozoic.

—Bromell, 1729: 531 (*Papilionum minorum*); Scudder, 1875b: 1 (not confirmed).
CI (larva?)/not stated [lost?]/Sweden: "saxo foetido, Westrogothia" [near now Gothenburg]/?late Paleozoic.

—Kernbach, 1967: 103 (?Schmetterlingspuppen) [multiple species].
CI (pupa)/GPUG (3 ex)/Germany: Hesse, Brandenburg, Willershausen–Harz/Piacenzian, Late Pliocene (Brauckmann *et al.* 2001).

—Müller, 1982: 13, pl. 3: 1–4, pl. 4: 4–5; Scott *et al.*, 1992: 141 (uncertain).
CI and T (leaf mine)/TUBF (1ex: FG 288/20)/Germany: Halle, Plötz/late Moscovian–Artinskian, Middle Pennsylvanian–Early Permian.
Fossil plant host: Callipteridiaceae —*Autunia conferta* (Sternberg) Kerp.
Comment: Labandeira (1998c) stated that these structures on a common, late Paleozoic peltasperm seed-fern are neither leaf mines nor lepidopteran in origin.

—Richter and Storch, 1988: 202 (Lepidoptera: Cossidae or Diptera: Culicidae).
GC (adult: cuticular fragments)/FNSF or GPUF/Germany: Hessen, Sieblos and Rhön (Sieblos Fm.)/Rupelian, Early Oligocene.

—Rohdendorf, 1939: 86 [in table] (?Lepidoptera).
CI (not stated)/PIRAS (2 ex)/Russia: near Voroshilovsk/Miocene.

—Rozefelds, 1985: 80, figs. B, C (lepidopteran or dipteran mines); Kristensen and Skalski, 1999: 16 (*incertae sedis*).
CI and T (leaf mine)/MVVA/Australia: Victoria, Alcoa Anglesea Coal Mine, S38°25′ E144°11′ (Eastern View Fm.)/Priabonian, Late Eocene.
Fossil plant host: Voltziaceae —*Heidiphyllum elongatum* (Morris) Retallack.
Comment: See Labandeira (1998c) for a discussion of these insect damage structures as nonlepidopteran in origin.

—Rozefelds, 1988a: 2, figs. 2e, 2f (lepidopteran or dipteran mines).
CI and T (leaf mine)/MVVA (1 ex: NMVP183065)/Australia: Victoria, Alcoa Anglesea Coal Mine, S38°25′ E144°11′ (Eastern View Fm.)/Priabonian, Late Eocene.
Fossil plant host: Elaeocarpaceae.

—Scudder, 1868: 627 (?Arctiidae).
SI (larva)/not stated/USA: Illinois, Will, Grundy and Kane Co., Morris Beds, Mazon Creek (Carbondale Fm.)/Moscovian, late Middle Pennsylvanian, Carboniferous.

—Sendelius, 1742: 169–171, pl. 5: 26–28, pl. 6: 1–4 (Lepidoptera) [multiple species].

AM (larva and pupa)/not stated (lost)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

Comment: Only the illustrations are available. To judge from the drawings, there could be some non-lepidopterans included in this collection.

—Skalski, 1974: 103, fig. 11 (Lepidoptera or Trichoptera).

AM (adult: whole body)/private collection, Oehlke Eberswalde, Germany (1 ex: LEP.SUCC.12 AWS)/Baltic Region (Baltic Amber, Prussian Fm.)/Lutetian, Middle Eocene.

—Stephenson, 1991: 116 (Feeding Type KFa).

= *Phagophytichnus marginis-folii* Straus, 1977: 66 [part].

CI and T (feeding damage)/MNPC (1 ex: F1856); GBIU (1 ex: IU15706-7254); FMNH (6 ex: UP256; PP6203b; PP9404; PP10533; PP11519; PP11525)/USA: Kansas and Nebraska, Braun Ranch, Hoisington and other localities (Dakota Fm.); Tennessee, Carroll Co., Vale, Cooper Pit (Ripley Fm.)/late Albian, Early Cretaceous; early Maastrichtian, Late Cretaceous.

Comment: The author did not attempt to directly link these trace fossils to extant lineages, but pointed out similarities. In his thesis (Stephenson, 1991), feeding marks by the extant *Lymantria* (Erebidae: Lymantriinae) and *Phryganidia* (Notodontidae) were noted as possible analogs to the fossils.

—Stephenson, 1991: 117 (Feeding Type KFb).

= *Phagophytichnus marginis-folii* Straus, 1977: 66 [part].

CI and T (feeding damage)/GBIU (1 ex: IU15706-7539); FMNH (1 ex: PP6563)/USA: Kansas and Nebraska, Braun Ranch, Hoisington and other localities (Dakota Fm.); Tennessee, Carroll Co., Vale, Cooper Pit (Ripley Fm.)/late Albian, Early Cretaceous; early Maastrichtian, Late Cretaceous.

Comment: The author did not attempt to directly link these trace fossils with extant lineages, but pointed out similarities. In his paper, various Lepidoptera were mentioned as producing analogous feeding damage.

—Stephenson, 1991: 117 (Feeding Type KFc).

= *Phagophytichnus marginis-folii* Straus, 1977: 66 [part].

CI and T (feeding damage)/GBIU (1 ex: IU15706-7540)/USA: Kansas and Nebraska, Braun Ranch, Hoisington and other localities (Dakota Fm.)/late Albian, Early Cretaceous.

Comment: The author did not attempt to directly link these trace fossils with extant lineages, but pointed out similarities. He suggested that recent analogs to these trace fossils could be found in either Lepidoptera or Hymenoptera.

—Stephenson, 1991: 127 (Feeding Type TF2a).

= *Phagophytichnus marginis-folii* Straus, 1977: 66 [part].

CI and T (feeding damage)/GBIU (1 ex: IU15820-5931); FMNH (6 ex: PP5389; PP5512; PP5853; PP8060; PP8066; PP12107); BMNH (7 ex: v46705; v47524a; v24286; v48690a; v49503; v49728; v50059)/USA: Tennessee, Henry Co., Puryear, Puryear Clay Pit (Claiborne Fm.) and United Kingdom: Hampshire, East Dorset, Bournemouth (Branksome Sand Fm.)/Lutetian, Middle Eocene (McElwaine, 1998).

Comment: The author did not attempt to directly link these trace fossils with extant lineages, but pointed out similarities. He suggested that feeding marks by the extant *Urodus parvula* (Urodidae) are a possible analog to the trace fossils.

—Stephenson, 1991: 128 (Feeding Type TF3).

= *Phagophytichnus marginis-folii* Straus, 1977: 66 [part].

CI and T (feeding damage)/FMNH (8 ex: PP4882; PP5309; PP5634; PP5762; PP5994; PP9075; PP10261; PP10270); BMNH (7 ex: v48434; v49080; v49752; v50112; v50152; v50220; v50937)/USA: Tennessee, Henry Co., Puryear, Puryear Clay Pit (Claiborne Fm.) and United Kingdom: Hampshire, East Dorset, Bournemouth (Branksome Sand Fm.)/Lutetian, Middle Eocene (McElwaine, 1998).

Comment: The author did not attempt to directly link these trace fossils with extant lineages, but pointed out simi-

larities. He suggested that damage by the extant *Nymphalis antiopa* (Nymphalidae) is a possible analog to the trace fossils.

—Stephenson, 1991: 135 (Feeding Type TF10a).
= *Phagophytichnus marginis-folii* Straus, 1977: 66 [part].
CI and T (feeding damage)/FMNH (1 ex: PP7745); BMNH (4 ex: v48215; v48404; v49925; v50020)/USA: Tennessee, Henry Co., Puryear, Puryear Clay Pit (Claiborne Fm.) and United Kingdom: Hampshire, East Dorset, Bournemouth (Branksome Sand Fm.)/Lutetian, Middle Eocene (McElwaine, 1998).
Comment: The author did not attempt to directly link these trace fossils with extant lineages, but pointed out similarities. He suggested feeding marks by the extant *Thyridopteryx ephemeraeformis* (Psychidae) as a possible analog to the trace fossils.

—Weyland *et al.*, 1960: 496 (probable eggs of insects, including Lepidoptera).
SR (egg)/FNSF/Germany: Upper Palatinate [= Oberpfalz]; Lower Rhine Bay, Embayment/Late Oligocene.

—Wilf *et al.*, 2005: 8944 (lepidopteran or coleopteran mines).
CI and T (leaf mine)/MPEF/Argentina: Chubut, Laguna del Hunco (Tufolitas Laguna de Hunco)/Ypresian, Early Eocene (Genise and Petrulevicius, 2001).
Fossil plant host: Araucariaceae —"*Zamia*" *tertiaria* Berry.
Comment: The plant host is a species of *Agathis*, rather than a cycad. The mine type resembles *Paraectopa* (Gracillariidae) or *Chrysorthenches* (Plutellidae) that occur on modern host species of *Agathis* (Wilf *et al.* 2005).

—Woodward, 1876: 64 (?Lepidoptera: *Tinea* sp.).
CI (not stated)/not stated/Coal Measures [possibly European part]/Late Carboniferous.
Comment: Woodward (1876) attributed the authorship of this record to "Fabricius." The original source cannot be found. Given the age of the fossil bed, it is very unlikely that the specimen actually represents a lepidopteran.

—Zherikhin and Sukacheva, 1973: 38 [in table] (?Lepidoptera).
AM (larva and pupa)/not stated [?PIRAS] (2 ex)/Russia: Siberia, E Taimyr, Taimyr Autonomous Okrug, Chatanga (Taimyr Amber, Kheta Fm.)/Coniacian, Late Cretaceous.

4. Fossils excluded from Lepidoptera

1) Name-bearing fossils

Archipsyche Handlirsch, 1906 [1907]: 624 (Lepidoptera), excluded by Carpenter (1932: 121) [Hemiptera: Palaeontinidae].

Beloptesis Handlirsch, 1906 [1907]: 625 (Lepidoptera), excluded by Hamilton (1992: 427) [Hemiptera: Palaeontinidae], a junior synonym of *Prolystra* Oppenheim, 1888.
Cyllonium Westwood, 1854: 395–396 (Lepidoptera); Handlirsch 1906 [1907]: 627, pl. 50: 14 (Lepidoptera *incertae sedis*), excluded by Scudder (1875b: 89) [Hemiptera].

benkerti Kuhn, 1951: 61, figs. 1–2 (*Geisfeldiella*), see *Geisfeldiella*.

boisduvalianum Westwood, 1854: 395, pl. 17: 17 (*Cyllonium*), see *Cyllonium*.

braueri Handlirsch, 1906 [1907]: 623–624, pl. 49: 17–18 (*Protopsyche*), a junior synonym of *Prolystra lithographica* Oppenheim, 1888, see *Protopsyche*.

compressa Oppenheim, 1885: 345, pl. 3: 11 (*Fabellovena*); Handlirsch, 1906: 576 (*Pseudosirex*); Maa, 1949: 17 (*Myrmicium*), see *Fabellovena*.

Curvicubitidae Hong, 1984: 782 (Lepidoptera), excluded by Whalley (1986: 267) [Neuroptera]; Kozlov (1988: 57) [Hemiptera].

Curvicubitus Hong, 1984: 782 (Lepidoptera: Curvicubitidae), excluded by Whalley (1986) [Neuroptera]; Kozlov (1988) [Hemiptera].

damesi Oppenheim, 1885: 333, pl. 1: 3 (*Phragmoecites*), see *Phragmoecites*.

eichstaettensis Handlirsch, 1906 [1907]: 624, pl. 50:1–2 (*Archipsyche*), see *Archipsyche*.

elegans Oppenheim, 1885: 345, pl. 3: 14 (*Fabellovena*); Handlirsch, 1906: 576 (*Pseudosirex*); Maa, 1949: 17 (*Myrmicium*), see *Fabellovena*.

Eocicada Oppenheim, 1888: 229 (Hemiptera); Handlirsch, 1906 [1907]: 626–7, pl. 50: 7–9 (Lepidoptera), excluded by Tillyard (1921: 282; 1933: 71) [Hemiptera: Palaeontinidae].

Eoses Tindale, 1945: 39 (Lepidoptera), excluded by Riek (1955: 660); Willmann (1984: 232) [Mecoptera], a junior synonym of *Mesochorista* Tillyard, 1916.

Eosetidae Tindale, 1945: 39 (Lepidoptera); Bourgogne, 1951: 365 (pathologic specimen), excluded by Willmann (1984: 232) [Mecoptera], a junior synonym of Permochoristidae Tillyard, 1917.

Fabellovena Oppenheim, 1885: 344 (Lepidoptera: Fabellovenae), excluded by Maa (1949: 17) [Hymenoptera: Myrmiciidae], a junior synonym of *Myrmicium* Westwood, 1854.

Fabellovenae Oppenheim, 1885: 344 (Lepidoptera), excluded by Maa (1949: 17) [Hymenoptera: Myrmiciidae].

Geisfeldiella Kuhn, 1951: 61 (Lepidoptera), excluded by Kluge (2004: 360) [Pterygota *incertae sedis*, possibly Odonata].

gigantea Weyenbergh, 1874: 101, pl. 3:4 (*Cicada*); Handlirsch, 1908 [1907]: 626, pl. 50:6 (Lepidoptera: *Beloptesis*? *gigantea*), excluded by Haase (1890: 20); Frickhinger (1994: 152) [Hemiptera: Palaeontinidae], a senior synonym of *Prolystra lithographica* Oppenheim, 1888.

gracilis Oppenheim, 1885: 344, pl. 2: 10 (*Rhipidorhabdus*); Handlirsch, 1906: 576 (*Pseudosirex*); Maa, 1949: 17 (*Myrmicium*), see *Rhipidorhabdus*.

hewitsonianum Westwood, 1854: 396, pl. 18: 27 (*Cyllonium*), see *Cyllonium*.

incertus Daudet, 1876: 415, pl. 17: 1–4 (*Satyrites*), excluded by Nel and Nel (1985: 129) [plant material].

jurassicus Oppenheim, 1885: 333, pl. 10: 4, 6 (*Palaeocossus*), see *Palaeocossus*.

karschi Oppenheim, 1885: 344, pl. 3: 13 (*Fabellovena*); Handlirsch, 1906: 576 (*Pseudosirex*); Maa, 1949: 17 (*Myrmicium*), see *Fabellovena*.

lameerei Handlirsch, 1906 [1907]: 627, pl. 50:10–12 (*Eocicada*), a junior synonym of *Eocicada microcephala* Oppenheim, 1888, see *Eocicada*.

Limacodites Handlirsch, 1906 [1907]: 622 (Lepidoptera: Limacodidae); van Schepdael, 1974: 4–5 (Lepidoptera: Limacodidae), excluded by Carpenter (1932: 120); Hamiltion (1992: 427) [Hemiptera: Palaeontinidae], a junior synonym of *Archipsyche* Handlirsch, 1906.

lithographica Oppenheim, 1888: 228–229, pl. 31: 1 (*Prolystra*), see *Prolystra*.

lithophilus Germar, 1842: 88 (*Tineites*), excluded by Haase (1890: 2); Demoulin (1955: 4) [Ephemeroptera].

macroceraticus Oppenheim, 1885: 347, pl. 12: 15 (*Ocnerites*), see *Ocnerites*.

magna Riek, 1976: 817, fig. 17, pl. 3: 4 (*Mesoses*), see *Mesoses*.

Mesoses Riek, 1976: 816 (Lepidoptera), excluded by Schlüter (1997: 309–310) [nonlepidopteran Paratrichoptera].

Mesosetidae Riek, 1976: 816 (Lepidoptera), excluded by Schlüter (1997: 309–310) [nonlepidopteran Paratrichoptera].

mesozonicus Handlirsch, 1906 [1907]: 622–623, pl. 49: 12–15 (*Limacodites*), a junior synonym of *Archipsyche eichstaettensis* Handlirsch, 1906, see *Limacodites*.

microcephala Oppenheim, 1888: 229, pl. 31: 30 (*Eocicada*), see *Eocicada*.

minimus Oppenheim, 1885: 344, pl. 2: 9 (*Rhipidorhabdus*); Handlirsch, 1906: 576 (*Pseudosirex*); Maa, 1949: 17 (*Myrmicium*), see *Rhipidorhabdus*.

Ocnerites Oppenheim, 1885: 347 (Lepidoptera: Lymantriidae), excluded by Haase (1890: 25) [Trichoptera].

oolitica Butler,1873: 126, pl. 48: 1–2 (*Palaeontina*), see *Palaeontina*.

oppenheimi Handlirsch, 1908 [1907]: 625–626, pl. 50:3–5 (*Beloptesis*), a junior synonym of *Prolystra lithographica* Oppenheim, 1888, see *Beloptesis*.

optata Riek, 1976: 816, fig. 16, pl. 3: 3 (*Mesoses*), see *Mesoses*.

Pachypsyche Handlirsch, 1906 [1907]: 623 (Lepidoptera), excluded by Meunier (1902: 10); Hamilton (1992: 427) [Hemiptera: Palaeontinidae].

Palaeocossus Oppenheim, 1885: 333 (Lepidoptera: Cossidae); Handlirsch, 1906 [1907]: 622, pl. 49: 10–11 (Lepidoptera: Palaeonitidae), excluded by Cockerell (1924: 135) [Hemiptera: Palaeontinidae].

Palaeontina Butler, 1873: 126 (Lepidoptera: Nymphalidae); Handlirsch, 1906 [1907]: 620, pl. 49: 1–7 (Lepidoptera: Palaeontinidae), excluded by Scudder (1875b: 89–95); Tillyard (1921: 281–282) [Hemiptera: Palaeontinidae].

Palaeontinidae Handlirsch, 1906 [1907]: 618 (Lepidoptera), excluded by Scudder (1875b: 89–95); Tillyard (1921: 281–282) [Hemiptera: Palaeontinidae].

Paratrichoptera Tillyard, 1919: 199 (Order nov.); Riek, 1976: 814 (Lepidoptera); excluded by Schlüter (1997: 307–310) [polyphyletic mecopteroid stock].

Phragmoecites Oppenheim, 1885: 333 (Lepidoptera: Cossidae); Handlirsch, 1908 [1907]: 621, pl. 49: 8–9 (Lepidoptera: Palaeonitidae), excluded by Haase (1890: 15–16); Cockerell (1924: 135) [Hemiptera: Palaeontinidae].

Prolystra Oppenheim, 1888: 228 (Hemiptera); Handlirsch, 1906 [1907]: 624–625, pl. 49: 20–23 (Lepidoptera), excluded by Haase (1890: 18–19); van Schepdael (1974: 4); Hamilton (1992: 427) [Hemiptera: Palaeontinidae].

Protopsyche Handlirsch, 1906 [1907]: 623 (Lepidoptera), excluded by van Schepdael (1974: 4); Hamilton (1992: 427) [Hemiptera: Palaeontinidae].

Rhipidorhabdi Oppenheim, 1885: 344 (Lepidoptera), excluded by Haase (1890: 27); Maa (1949: 17) [Hymenoptera: Myrmiciidae].

Rhipidorhabdus Oppenheim, 1885: 344 (Lepidoptera: Rhipidorhabdi), excluded by Haase (1890: 27); Maa (1949: 17) [Hymenoptera: Myrmiciidae], a junior synonym of *Myrmicium* Westwood, 1854.

schroeteri Germar, 1839: 193 (*Sphinx*); Hagen, 1862: 109 (*Belostoma*); Weyenbergh, 1869: 250, 272 (?*Hagenia*); Oppenheim, 1885: 344, pl. 2: 7 (*Rhipidorhabdus*); Deichmüller, 1886: 82 (*Pseudosirex*); Maa, 1949: 17 (*Myrmicium*), excluded by Deichmüller (1886: 82); Maa (1949: 17) [Hymenoptera: Myrmiciidae].

snelleni Weyenbergh, 1869: 261, pl. 34: 9 (*Sphinx*); Handlirsch, 1906: 575 (*Pseudosirex*), a junior synonym of *Sphinx schroeteri* Germar, 1839, see *schroeteri*.

triassica Tindale, 1945: 39, pl. 5 (*Eoses*); Riek, 1955: 660 (= *Mesochorista proavita*), see *Eoses*.

triassicus Hong, 1984: 783, fig. 1, pl. 1: 1 (*Curvicubitus*), see *Curvicubitus*.

vidali Meunier, 1902: 9, pl. 4: 3–5 (*Palaeontina*); Handlirsch, 1908 [1907]: 623–624, pl. 49: 19 (*Pachypsyche*), see *Pachypsyche*.

2) Unnamed fossils

—Anderson and Anderson, 1995: 36, tbl. 2; Anderson and Anderson, 1999: 77 [in table], fig. 26 (?Lepidoptera), see *Mesoses*.

Comment: For Lepidoptera, the authors originally counted 8 individuals belonging to 2 assemblages which exist in their collection (BWUP). Anderson and Anderson (1999) presented a drawing of one exemplar specimen which is obviously the same specimen as *Mesoses magna* described by Riek (1976). Likewise, three specimens described by Schlüter (1997) are possibly a part of Anderson and Anderson's collection. Considering the possibility for overlap, we reduce the original count to 4 specimens. It is likely that these four specimens belong to *Mesoses* as well.

—Barthel and Hetzer, 1982: 333 (Micropterigidae), excluded by Kozlov (1988: 57) [Trichoptera].

—Beringer and Hübner, 1726: 94 (*Papilionum* spp.); Scudder, 1875b: 1 (*incertae sedis*), excluded here [a fossil forgery (see Jahn and Wolff, 1963)].

—Bronn, 1837: 210, 481 (*Sphynx* [sic]), see *schroeteri* Germar, 1839.

—Brodie, 1845: xvii, pl. 1: 11 (caterpillar?), excluded here [unknown animal class].

—Guérin-Ménevilles, 1838: 170, excluded by Skalski (1977: 5) [Diptera: multiple species].

Comment: As Skalski (1977) indicated, the original author mistakenly listed the dipteran fossils under "Lepidoptera."

—Meyer, 2003: 162, fig. 193 (Lepidoptera or Trichoptera), excluded here [Trichoptera].

—Nel and Nel, 1985: 126, figs. 11, 12 (Sphingidae), excluded here [plant material].

Comment: Dr. André Nel carefully reexamined the specimen and some additional materials and found that these are actually flower petals of *Nymphaea* (pers. comm.).

—Schlotheim, 1820: 42 (*Sphinx*), see *schroeteri* Germar, 1839.

—Schröter, 1784: 411, pl. 3: 16 (*Sphinx*), see *schroeteri* Germar, 1839.

—Schlüter, 1997: 310, fig. 5a (Mesosetidae), see *Mesoses*.

—Scudder, 1867: 117 (?Limacodidae sp.), excluded by Scudder (1877: 741) [Diptera].

—Whalley, 1986: 269, fig. 17 (Amphiesmenoptera), excluded here [pre-lepidopteran Amphiesmenoptera].
Comment: Whalley stated that this fossil could be an ancestor of Antliophora and Amphiesmenoptera. However, the wing venation shows that it is related to the neuropteroid orders.

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References

Alonso, J., Arillo, A., Barrón, B., Corral, J.C., Grimalt, J., López, J.F., López, R., Martínez-Declòs, X., Otuño, V., Peñalver, E. & Trincão, P.R. (2000) A new fossil resin with biological inclusions in Lower Cretaceous deposits from Álava (northern Spain, Basque-Cantabrian Basin). *Journal of Paleontology*, 74(1), 158–178.

Andrée, K. (1951) *Der Bernstein, das Bernsteinland und Sein Leben*. Kosmos, Stuttgart, 95 pp.

Andersen, N.M. & Andersen, S. (1996) Kampemyrer og andre danekra fra Limfjordens askeserie–Studiet af en uddød insektfauna fra Danmarks Palaeogen. *Naturens Verden*, 11/12, 417–432.

Anderson, J.M. & Anderson, H.M. (1995) The Molteno Formation: window onto Late Triassic floral diversity. *Birbal Sahni Centenary*, 1995, 27–40.

Anderson, J.M. & Anderson, H.M. (1999) The Molteno Formation: the Triassic explosion and gymnosperm heyday. *In*: Anderson, J.M. (Ed.), *Towards Gondwana Alive: Promoting Biodiversity and Stemming the Sixth Extinction*. Gondwana Alive

Society, Pretoria, pp. 74–83.
Ansorge, J. (1996) Insekten aus dem oberen Lias von Grimmen (Vorpommern, Norddeutschland). *Neue Paläontologische Abhandlungen*, 2, 1–132.
Ansorge, J. (2002) Revision of the "Trichoptera" described by Geinitz and Handlirsch from the Lower Toarcian of Dobbertin (Germany) based on new material. *Proceedings of the 10th International Symposium on Trichoptera, Nova Supplementa Entomologica*, 15, 55–74.
Ansorge, J. & Kohring, R. (1995) Insekten aus dem Randecker Maar. *Fossilien*, 2, 80–90.
Archibald, B. (1995) *Some Eocene Insects from the Interior of British Columbia*. No. 1. The Vancouver Paleontological Society, Vancouver, 18 pp.
Archibald, S.B. & Makarkin, V.N. (2006) Tertiary giant lacewings (Neuroptera: Polystoechotidae): Revision and description of new taxa from western North America and Denmark. *Journal of Systematic Palaeontology*, 4(2), 119–155.
Ash, S. (1997) Evidence of arthropod-plant interactions in the Upper Triassic of the southwestern United States. *Lethaia*, 29, 237–248.
Ash, S. & Hasiotis, S.T. (1996) Upper Triassic arthropod–plant interactions in the American Southwest. *Abstracts of the Fifth Conference of the International Organisation of Palaeobotany.* Santa Barbara, California, p. 4.
Azar, D., Gèze, R. & Acra, F. (2010) Lebanese amber. *In*: Penny, D. (Ed.), *Biodiversity of Fossils in Amber from the Major World Deposits*. Siri Scientific Press, Manchester, pp. 271–298.
Bachofen-Echt, A. (1949) *Der Bernstein und Seine Einschlüsse*. Springer-Verlag, Vienna, 204 pp.
Baciu, D.-S., Bannikov, A.F. & Santini, F. (2005) A new species of Caproidae (Acanthomorpha, Teleostei) from the Messinian (upper Miocene) of Oran (Algeria). *Geodiversity*, 27(3), 381–390.
Barthel, M. & Hetzer, H. (1982) Bernstein-inklusen aus dem Miozän des Bitterfelder Raumes. *Zeitschrift für Angewandte Geologie*, 28(7), 314–336.
Bauer, A.M., Böhme, W. & Weitschat, W. (2005) An Early Eocene gecko from Baltic amber and its implications for the evolution of gecko adhesion. *Journal of the Zoological Society of London*, 265, 327–332.
Benassi, P. (1896) Piante ed insetti fossili di Re in Val Vigezzo. *Rivista Italiana di Paleontologia*, 2, 315–320.
Bennike, O. & Bøcher, J. (1990) Forest-tundra neighbouring the North Pole: plant and insect remains from the Plio–Pleistocene Kap København Formation, North Greenland. *Arctic*, 43(4), 331–338.
Berendt, G.C. (1830) *Die Insekten im Bernstein ein Beitrag zur Thiergeschichte der Vorwelt*. Nicolai, Danzig, 38 pp.
Beringer, J.B.A. & Hübner, G.L. (1726) *Lithographiae Wirceburgensis, Ducentis Lapidum Figuratorum, a Potiori Insectiformium, Prodigiosis Imaginibus Exornatae, Specimen Primum*. Würzburg, 96 pp+21 pls.
Berry, E.W. (1916) The Lower Eocene floras of southeastern North America. *U.S. Geological Survey, Professional Paper Series*, 91, 1–481.
Bigot, L., Nel, A. & Nel, J. (1986) Description de la première éspèce fossile connue de Ptérophore (Lepidoptera, Pterophoridae). *Alexanor*, 14(6), 283–288.
Blair, K.G. (1927) Insect remains from oil sand in Trinidad. *Transactions of the Entomological Society of London*, 75, 137–141.
Bloch, D. (1776) Beytrag zur Naturgeschichte des Kopals. *Beschäftigungen der Berlinischen Gesellschaft naturforschender Freunde*, 91–196.
Boisduval, M. (1838) Bulletin entomologique. *Annales de la Société Entomologique de France*, 7, xlix–lvi.
Boisduval, M. (1840) Sur une empreinte de Lepidoptére trouvée dans les marnes des environs d'Aix, en Provence, et commeniqée par M. de Saporta. *Annales de la Société Entomologique de France*, 9, 371–374.
Bonde, N., Andersen, S., Hald, N. & Jakobsen, S.L. (2008) *Danekra –Danmarks bedste fossiler*. Gyldendal, Copenhagen, 224 pp.
Boucot, A.J. (1990) *Evolutionary Paleobiology of Behavior and Coevolution*. Elsevier, Amsterdam, Oxford, New York & Tokyo, 725 pp.
Bourgogne, J. (1951) Order des Lepidopteres. *In*: Grasse, P.P. (Ed.), *Traité de Zoologie, Anatomie, Systematique, Biologie*, Vol. 10. Masson, Paris, pp. 174–448.
Branscheid, F. (1968) Ein weiterer Schmetterlingsflügel aus dem Pliozän von Willershausen. *Beihefte zu den Berichten der Naturhistorischen Gesellschaft zu Hannover*, 6, 41–42.
Branscheid, F. (1969) Funde von Tagfaltern (Rhopalocera, Lepidopt.) im Pliozän von Willershausen. *Berichte der Naturhistorischen Gesellschaft, Hannover*, 113, 101–106.
Branscheid, F. (1977) Fossile Schmetterlinge (Rhopalocera, Lepidopt.) aus dem Pliozän von Willershausen. *Beiträge zur Naturkunde Niedersachsens*, 30, 85–88.
Brauckmann, C., Brauckmann, B. & Gröning, E. (2001) Anmerkungen zu den bisher beschrieben Lepidopteren aus dem Jung-Tertiär (Pliozän) von Willershausen am Harz. *Jahresberichte des Naturwissenschaftlichen Vereins Wuppertal*, 54, 31–41.
Brito, I.M. & Ribeiro, F.A.M. (1975) Ocorrência de Lepidoptera nos folhelhos de Tremembé de algumas conciderações sobre a bacia geológica do Paraíba, Estado de São Paulo. *Anais da Academia Brasileira de Ciências*, 47(1), 105–111.
Brodie, P.B. (1845) *A History of the Fossil Insects in the Secondary Rocks of England*. John van Voorst, London, 130 pp.
Brodie, P.B. (1873) The distribution and correction of fossil insects, and the supposed occurrence of Lepidoptera and Arachnidae in British and foreign strata, chiefly in the secondary rocks. *Warwickshire Natural History and Archaeological Society, Annual Report*, 37, 12–28.
Brodie, P.B. (1894a) Further remarks on the Tertiary (Eocene) insects from the Isle of Wight and on others from the Lias and

Coal Measures. *Geological Magazine*, (2)1, 167–169.
Brodie, P.B. (1894b) Notes on the Eocene Tertiary insects of the Isle of Wight. *Proceedings of the Warwickshire Natural History and Archaeological Field Club*, 1894, 67–70.
Bromell, M. (1729) Lithographia suecana, Section de lapidibus insectiferis scanicis et gothicis. *Acta Litteraria Sueciae*, 2, 493–497, 524–533.
Bronn, H.G. (1837) *Lethaea Geognostica oder Abbildungen und Beschreibungen der für die Gebirgs-Formationen bezeichnendsten Versteinerungen*, Vol. 1. E. Schweizerbart's Verlagshandlung, Stuttgart, 544 pp.
Brooks, H.K. (1955) Healed wounds and galls on fossil leaves from the Wilcox deposits (Eocene) of Western Tennessee. *Psyche*, 62(1), 1–9.
Brown, F.M. (1976) *Oligodonta florissantensis*, gen. n., sp. nov. (Lepidoptera: Pieridae). *Bulletin of the Allyn Museum*, 37, 1–4.
Bryk, F. (1912) "Parnassiana" V. Zur synopsis der asiatischen *Mnemosyne*. *Societas Entomologica*, 27, 52–53.
Bryk, F. (1913) Über eine neue Einteilung der Papilionidae unter Berücksichtigung des Flügelgeäders. *Archiv für Naturgeschichte A*, 79(2), 116–121.
Bryk, F. (1916) Über das Abändern der Rippenkonfiguration im Genus *Parnassius* Latr. *Archiv für Naturgeschichte A*, 82(5), 35–74.
Burgeff, H. (1951) Die Meeralpengrenze der Zygaenen (Lep.), eine mit Hilfe der Populationsanalyse der Arten der Gattung *Zygaena* (Lepidoptera) durchgeführte Untersuchung über die Lokalisation und die Bedeutung geographischer Rassen in ihrem Zusammenhang mit der Eiszeit. *Biologisches Zentralblatt*, 70(1/2), 1–23.
Butler, A.G. (1873) On fossil butterflies. *In*: Butler, A.G. (Ed.), *Lepidoptera Exotica*, Descriptions and illustrations of exotic Lepidoptera, Janson, E.W. (publ.), London, pp. 126–128, pl. 48.
Butler, A.G. (1889) Description of a new genus of fossil moths belonging to the geometrid family Euschemidae. *Proceedings of the Zoological Society of London*, 59, 292–297.
Carpenter, F.M. (1932) Jurassic insects from Solenhofen in the Carnegie Museum and the Museum of Comparative Zoölogy. *Annals of the Carnegie Museum*, 21, 97–129.
Carpenter, F.M. (1985) Substitute names for some extinct genera of fossil insects. *Psyche*, 92, 575–582.
Carpenter, F.M. (1992) Superclass Hexapoda. *In*: Kaesler, R.L., Brosius, E., Keim, J. & Priesner, J. (Eds.), *Treatise on Invertebrate Paleontology*, Part R (Arthropoda-4), 3 and 4 (Superclass Hexapoda). Geological Society of America and the University of Kansas, Boulder, Colorado and Lawrence, Kansas, pp. xxi+655.
Cavallo, O. & Galletti, P.A. (1987) Studi di Carlo Sturani su Odonati e altri insetti fossili del Messiniano albese (Piemonte) con descrizione di *Oryctodiplax gypsorum* n. gen. n. sp. (Odonata, Libellulidae). *Bollettino della Societá Paleontologica Italiana*, 26(1/2), 151–176.
Chambers, V.T. (1882) Burrowing larvae. *Nature*, 25(649), 529.
Chandler, M.E.J. (1926) The Upper Eocene Flora of Hardle, Hants. *Monograph of the Palaeontographical Society, London*, 78(361), 33–52.
Chandler, M.E.J. (1961) Flora of the Lower Headon beds of Hampshire and the Isle of Wight. *Bulletin of the British Museum (Natural History) Geology*, 5(5), 93–157.
Charpentier, T. (1843) Über Einige Fossile Insecten aus Radoboj in Croatien. *Verhandlungen der Kaiserlichen Leopoldinisch–Carolinischen Akademie der Naturforscher*, 12, 399–410, pl. 20–23.
Churcher, C.S. (1966) The insect fauna from the Talara tar seeps, Peru. *Canadian Journal of Zoology*, 44(6), 985–993.
Clark, J., Cole, R., Fawcett, S., Green, M., Howcroft, J., Niedbala, S., Rawkins, K., Théobald, O. & Tobias, M. (1971) *The Zoological Record* (1967). Vol. 104, 13. Insecta. The Zoological Society of London, London, 704 pp.
CoBabe, E.A., Chamberlain, K.R., Ivie, M.A. & Giersch, J.J. (2002) A new insect and plant Lagerstätte from a Tertiary lake deposit along the Canyon Ferry Reservoir, southwestern Montana. *Rocky Mountain Geology*, 37(1), 13–30.
Cobbett, A., Wilkinson, M. & Wills, M.A. (2007) Fossils impact as hard as living taxa in parsimony analyses of morphology. *Systematic Biology*, 56(5), 753–766.
Cockerell, T.D.A. (1907a) A fossil caterpillar. *The Canadian Entomologist*, 39, 187–188.
Cockerell, T.D.A. (1907b) A fossil butterfly of the genus *Chlorippe*. *The Canadian Entomologist*, 39, 361–362.
Cockerell, T.D.A. (1907c) A fossil tortricid moth. *The Canadian Entomologist*, 39, 416.
Cockerell, T.D.A. (1908) Fossil insects from Florissant, Colorado. *Bulletin of the American Museum of Natural History*, 24, 59–69, pl. 5.
Cockerell, T.D.A. (1909) A catalogue of the generic names based on American insects and arachnids from the Tertiary rocks, with indications of the type species. *Bulletin of the American Museum of Natural History*, 26, 77–86.
Cockerell, T.D.A. (1914) Fossil Saturniidae. *In*: Packard, A.S. & Cockerell, T.D.A. (Ed.), Monograph of the Bombycine Moths of North America, Part III. *Memoir of the National Academy of Science*, 12, 271.
Cockerell, T.D.A. (1916) Some American fossil insects. *Proceedings of the United States National Museum*, 51(2146), 89–106.
Cockerell, T.D.A. (1919) Two interesting insects in Burmese amber. *The Entomologist*, 52(676), 193–195.
Cockerell, T.D.A. (1921) Fossil arthropods in the British Museum —VI. Oligocene Insects from Gurnet Bay, Isle of Wright. *Annals and Magazine of Natural History*, (9)7, 453–480.
Cockerell, T.D.A. (1922) A fossil moth from Florissant, Colorado. *American Museum Novitates*, 34, 1–2.
Cockerell, T.D.A. (1924) Fossils in the Ondai Sair Formation, Mongolia. *Bulletin of the American Museum of Natural History*, 51, 129–144, pl. 1–2.

Cockerell, T.D.A. (1926) A new fossil moth from Florissant. *Psyche*, 33, 16–17.
Cockerell, T.D.A. (1933) A second moth from the Colorado Eocene. *The American Naturalist*, 67, 479–480.
Cockerell, T.D.A. & LeVeque, N. (1931) The antiquity of insect structures. *The American Naturalist*, 65, 351–359.
Comstock, W.P. (1961) *Butterflies of the American Tropics, The genus* Anaea*, Lepidoptera, Nymphalidae*. The American Museum of Natural History, New York, 214 pp.
Curtis, J. (1829) Observations upon a collection of fossil insects discovered near Aix in Provence, in the summer of 1828, by R. J. Murchison, esq. and Charles Lyell esq., jun. *Edinburgh New Philosophical Journal*, 7, 293–297.
D'Abrera, B. (2001) *The Concise Atlas of Butterflies of the World*. Hill House Publishers, Melbourne and London, 353 pp.
Dalman, J.W. (1826) Om Insekter inneslutne i Copal: jemte beskrifning på några deribland förekommande nya slägten och arter. *Kongliga Veternskaps-Akademiens Handlingar*, 1825(II), 375–410, pl. 5.
Danilevsky, A.S. & Martynova, O.M. (1962) Order Lepidoptera. Butterflies and moths. *In*: Rohdendorf, B.B. (Ed.), *Fundamentals of Paleontology*, Vol. 9. Arthropoda, Tracheata, Chelicerata. Akademiya Nauk SSSR Publishers, Moscow, pp. 437–444.
Daudet, H. (1876) Description d'une chenille fossile touvée dans calcaire d'Aix (Provence). *Revue et Magasin de Zoologie*, 415–424, pl. 17.
Davis, D.R. (1989) An exceptional fossil amber collection acquired by the Smithsonian Institution. *Proceedings of the Entomological Society of Washington*, 91(4), 545–550.
Davis, D.R. (1994) New leaf-mining moths from Chile, with remarks on the history and composition of Phyllocnistinae (Lepidoptera: Gracillariidae). *Neotropical Lepidoptera*, 5, 65–75.
de Jong, R. (2007) Estimating time and space in the evolution of the Lepidoptera. *Tijdschrift voor Entomologie*, 150, 319–346.
Deichmüller, V. (1886) Die Insekten aus dem lithographischen Schiefer im Dresdner Museum. *Mittheilungeil aus dem Königlische Mineralogisch-Geologischen und praehistorischen Museum in Dresden*, 7, 1–88
Demoulin, G. (1955) Contribution a l'étude morphologique systématique et phylogénique des Éphéméroptères Jurassiques d'Europe Centrale. *Koninklijk Belgisch Instituut voor Natuurwetenschappen, Mededelingen*, 31(39), 1–14.
de Saporta, G. (1872) Études sur la Végétation du Sud-Est de la France. A l'époque Tertiaire. *Annales des Sciences Naturelles*, (5)15, 277–351.
de Serres, M. (1829) *Géognosie des Terrains Tertiaires ou Tableau des Principaux Animaux Invertébrés des Terrains Marins Tertiaires, du midi de la France*. Romathio-Durville, Montpellier & Paris, 276 pp.
DeVries, P.J. & Poinar, Jr., G.O. (1997) Ancient butterfly-ant symbiosis: direct evidence from Dominican amber. *Proceedings of the Royal Society of London B*, 264, 1137–1140.
Donner, H. & Wilkinson, C. (1989) Nepticulidae (Insecta: Lepidoptera). *Fauna of New Zealand*, 16, 1–88.
Douglas, S.D. & Stockey, R.A. (1996) Insect fossils in middle Eocene deposits from British Columbia and Washington State: faunal diversity and geological range extensions. *Canadian Journal of Zoology*, 74(6), 1140–1157.
Drummond, A.J., Ho, S.Y.W., Phillips, M.J. & Rambaut, A. (2006) Relaxed phylogenetics and dating with confidence. *PLOS Biology*, 4(5), 699–710.
Duncan, I.J. (1997) *The Taphonomy of Insects*. Ph. D. thesis, Department of Geology, University of Bristol. Bristol, United Kingdom, xvi+328 pp.
Dunlop, J.A. & Jekel, D. (2008) The oldest available fossil arachnid name. *Palaeodiversity*, 1, 87–92.
Durden, C.J. & Rose, H. (1978) Butterflies from the Middle Eocene: the earliest occurrence of fossil Papilionoidea (Lepidoptera). *Pearce-Sellards Series, Texas Memorial Museum*, 29, 1–25.
Edwards, W.H. (1868) *The Butterflies of North America*, Volume 1. The American Entomological Society, Philadelphia, 450 pp.
Engel, M.S. & Kinzelbach, R.K. (2008) A primitive moth from the earliest Eocene Fur Formation ("Mo-clay") of Denmark (Lepidoptera: Micropterigidae). *Linzer biologische Beiträge*, 40(2), 1443–1448.
Evans, W.P. (1931) Traces of a lepidopterous insect from Middle Waikato Coal-Measures. *Transactions and Proceedings of the New Zealand Institute*, 62(1), 99–101.
Evers, J. (1907) Copal-Schmetterlinge. *Entomologisches Jahrbuch*, 1907, 129–132.
Fernández-Rubio, F. & Nel, A. (2000) *Neurosymploca*? *oligocenica* a new fossil species of Lepidoptera Zygaenoidea of the Oligocene of Céreste (Lubéron, France). *Boletin Sociedad Entomológica Aragonesa*, 27, 7–16.
Fernández-Rubio, F., Peñalver, E. & Martíez-Delclòs, X. (1991) *Zygaena*? *turolensis*, una nueva especie de Lepidoptera Zygaenidae del Mioceno de Rubielos de Mora (Teruel). Descripción y filogenia. *Estudios del Museo de Ciencias Naturales de Alava*, 6, 77–93.
Fernández-Rubio, F. & Peñalver, E. (1994) Un nuevo ejemplar fósil de *Zygaena*? *turolensis* Fernández-Rubio, Peñalver & Martínez-Delclòs, 1991 (Lepidoptera: Zygaenidae). *Estudios del Museo de Ciencias Naturales de Alava*, 9, 39–48.
Fletcher, T.B. (1940) New generic names for microlepidoptera. *Entomologist's Record*, 52, 17–19.
Fletcher, D.S. (1979) *Generic Names of Moths of the World.* Volume 3. Trustees of the British Museum (Natural History), London, xx+243 pp.
FIRGNE (Fossil Insect Research Group for Nojiri-ko Excavation) (1990) Fossil Insects obtained from the Nojiri-ko Formation during the 10th Nojiri-ko and the 5th Hill Site excavation. *Monograph of the Association for the Geological Collaboration in Japan*, 37, 93–110.
Forbes, T.M. (1931) The oldest moth. *The American Naturalist*, 65(700), 479–480.

Freeman, T.N. (1965) A lepidopterous leaf-mine from the Tertiary Period. *The Canadian Entomologist*, 97, 1069–1070.
Frey, D.G. (1964) Remains of animals in Quaternary lake and bog sediments and their interpretation. *Archiv für Hydrobiologie, Beihefte*, 2, 1–114.
Frickhinger, K.A. (1994) *The Fossils of Solnhofen*. Goldschneck-Verlag, Korb, 336 pp.
Fritsch, A. (1882) Fossile Arthropoden aus der Steinkohlen- und Kreideformation Böhmens. *Beiträge zur Paläontologie Österreich-Ungarns*, 2, 1–7, pl. 1–2.
Fujiyama, I. (1968) A Pleistocene fossil *Papilio* from Shiobara, Japan. *Bulletin of the National Science Museum*, Tokyo, 11(1), 85–95.
Fujiyama, I. (1983a) Neogene termites from northeastern districts of Japan, with references to the occurrence of fossil insects in the districts. *Memoirs of the National Science Museum*, 16, 83–98.
Fujiyama, I. (1983b) A Pleistocene nymphalid butterfly from Shiobara, Japan. *Bulletin of the National Science Museum (C)*, 9(4), 121–126.
Gall, L.F. & Tiffney, B.H. (1983) A fossil noctuid moth egg from the Late Cretaceous of eastern North America. *Science*, 219, 507–509.
Gelhaus, J.K. & Johnson, R. (1996) First record of crane flies (Tipulidae: Limoniinae) in Upper Cretaceous Amber from New Jersey, U.S.A. *Transactions of the American Entomological Society*, 122(1), 55–65.
Genise, J.F. & Petrulevicius, J.F. (2001) Caddisfly cases from the early Eocene of Chubut, Patagonia, Argentina. *Abstracts of the Second International International Congress on Paleoentomology*, Kraków, Poland, pp. 12–13.
Gentilini, G. (1991) Occurrence of the genus *Penthetria* Meigen, 1803, from the Lower Messinian of central Italy. *Bollettino della Società Entomologica Italiana*, 123(3), 62–66.
George, V.P. (1952) On some arthropod microfossils from India. *Agra University Journal of Research*, 1, 83–108.
Germar, E.F. (1837) *Fauna insectorum Europae*. Fasciculus 19. Insectorum protogaeae specimen sistens insecta carbonum fossilium. Kümmel, Halle, pl. 1–25
Germar, E.F. (1839) Die versteinerte Insecten Solenhofens. *Nova Acta Leopoldina*, 19, 187–222.
Germar, E.F. (1842) Beschreibung einiger neuen fossilen Insecten I., in dem lithographischen Schiefer Baierns, II. im Schieferthon des Steinkohlengebirges von Wetin. *Münster Beiträge, Petrefacten-Kunde*, 5, 79–90.
Gervais, M.P. (1877) Fossiles du Quercy. *Journal de Zoologie*, 6, 67–68.
Giebel, C.G. (1856) *Die Insecten und Spinnen der Vorwelt*. F.A. Brockhaus, Leipzig, 511 pp.
Giebel, C.G. (1862) Wirbelthier und Insektenreste im Bernstein. *Zeitschrift für die Gesammten Naturwissenschaften*, 20, 311–321.
Gielis, C. (1996) Pterophoridae. *In*: Huemer, P., Karsholt, O. & Lyneborg, L. (Eds.), *Microlepidoptera of Europe*, 1, 1–222.
Givulescu, R. (1984) Pathological elements on fossil leaves from Chiuzbaia (galls, mines and other insect traces). *Dări de Seamã ale Şedinţelor, Institute of Geology and Geophysics*, 18(3), 123–133.
Godthelp, H., Hand, S., Archer, M., Creaser, P., Jones, A., Norris, B. & Wicks, D. (2010) Amber from Cape York Peninsula: Australia's first significant amber deposit. *Abstracts from the International Congress of Paleoentomology ("Fossils X3")*, Beijing, p. 131.
Gradstein, F.M., Ogg, J.G. & Smith, A.G. (2004) *A Geologic Time Scale 2004*. Cambridge University Press, Cambridge, 589 pp.
Gravenhorst, H. (1835) Bericht der entomologischen Sektion. *Schlesische Gesellschaft für Vaterländische Kultur Jahresbericht*, 1834, 88–95.
Gregor, H.-J. (1990) Contribution to the Late Neogene and Early Quaternary floral history of the Mediterranean. *Review of Palaeobotany and Palynology*, 62, 309–338.
Greven, H. & Wichard, W. (2010) Butterflies or caddisflies? Comments on the chapter "De Papilionibus" from the "Historia Succinorum" (1742) written by Nathanael Sendel. *Entomologie Heute*, 22, 107–150.
Grimaldi, D.A. (1996) *Amber, Widow to the Past*. Harry N. Abrams, Inc., New York, 216 pp.
Grimaldi, D.A. & Engel, M.S. (2005) *Evolution of the Insects*. Cambridge University Press, Cambridge, 755 pp.
Grimaldi, D.A. & Nascimbene, P.C. (2010) Raritan (New Jersey) amber. *In*: Penny, D. (Ed.), *Biodiversity of Fossils in Amber from the Major World Deposits*. Siri Scientific Press, Manchester, pp. 167–191.
Grimaldi, D.A., Engel, M.S. & Nascimbene, P.C. (2002) Fossiliferous Cretaceous amber from Myanmar (Burma): Its rediscovery, biotic diversity, and paleontological significance. *American Museum Novitates*, 3361, 1–71.
Grimaldi, D.A., Shedrinsky, A. & Wappler, T.P. (2000) A remarkable deposit of fossiliferous amber from the Upper Cretaceous (Turonian) of New Jersey. *In*: Grimaldi, D.A. (Ed.), *Studies on Fossils in Amber, with Particular Reference to the Cretaceous of New Jersey.* Backhuys, Leiden, pp. 1–76.
Grote, A. R. (1901) Nachrichten aus dem Verein für Schmetterlingsfreunde in Hildesheim. *Inseckten-Börse*, 18, 108.
Guérin-Ménevilles, M. (1838) Note sur les insectes trouves dans l'ambre. *Revue Zoologique*, 1, 168–170.
Haase, E. (1890) Bemerkungen zur Palaeontologie der Insecten. *Neues Jahrbuch für Mineralogie, Geologie und Palaeontologie*, 2, 1–33.
Hagen, H.A. (1862) Ueber die Neuropteren aus dem lithographischen Schiefer in Bayern. *Palaeontographica*, 10(2), 96–145
Hagen, H.A. (1882) Fossil insects of the Dakota group. *Nature*, 25(638), 265–266.
Hall, J. (1845) Report of the exploring expedition to the Rocky Mountains in the year 1842, and to Oregon and North California in the year 1843–44. *In*: Fremont, J.C., *Twenty-eighth Congress, 2nd Session*. House Executive Document, p. 166, pl. 2.

Hall, J.P.W., Robbins, R.K. & Harvey, D.J. (2004) Extinction and biogeography in the Caribbean: new evidence from a fossil riodinid butterfly in Dominican amber. *Proceedings of the Royal Society of London (B)*, 271, 797–801.
Hamilton, K.G.A. (1992) Lower Cretaceous Homoptera from the Koonwarra Fossil Bed in Australia, with a new superfamily and synopsis of Mesozoic Homoptera. *Annals of the Entomological Society of America*, 85(4), 423–430.
Hammond, P.C. & Poinar, Jr., G.O. (1998) A larval brush-footed butterfly (Lepidoptera: Nymphalidae) in Dominican amber, with a summary of fossil Nymphalidae. *Entomologica Scandinavica*, 29, 275–279.
Hand, S., Archer, M., Bickel, D., Creaser, P., Dettmann, M., Godthelp, H., Jones, A., Norris, B. & Wicks, D. (2010) Australian Cape York amber. *In*: Penny, D. (Ed.), *Biodiversity of Fossils in Amber from the Major World Deposits*. Siri Scientific Press, Manchester, pp. 69–79.
Handschin, E. (1944) Insekten aus den Phosphoriten des Quercy. *Schweizerische Palaeontologische Abhandlungen*, 64(4), 1–23.
Handlirsch, A. (1906) *Die Fossilen Insekten und die Phylogenie der Rezenten Formen*. Lieferung 4. Wilhelm Engelmann, Leipzig, pp. 481–640.
Handlirsch, A. (1907) *Die Fossilen Insekten und die Phylogenie der Rezenten Formen*. Lieferung 6. Wilhelm Engelmann, Leipzig, pp. 801–960.
Handlirsch, A. (1908) *Die Fossilen Insekten und die Phylogenie der Rezenten Formen*. Textband. Wilhelm Engelmann, Leipzig, 1430 pp.
Handlirsch, A. (1939) Neue Untersuchungen über die fossilen Insekten mit Ergänzungen und Nachträgen sowie Ausblicken auf phylogenetische, palaeogeographische und allgemein biologische Probleme, II. Teil. *Annalen des Naturhistorischen Museums in Wien*, 49, 1–240, pl. 1–16.
Harris, A.C. (1984) New Zealand pre-Pleistocene insect fossils. *New Zealand Entomologist*, 8, 47–49.
Harris, A.C. & Raine, J.I. (2002) A sclerite from a late Cretaceous moth (Insecta: Lepidoptera) from Raikaia Gorge, Canterbury, New Zealand. *Journal of the Royal Society of New Zealand*, 32(3), 457–462.
Hayashi, M., Yahiro, K. & Kitabayashi, E. (2005) Middle Pleistocene fossil insects from the Hirabaru Formation of Kitsuki City, Oita Prefecture, Kyushu, Japan. *Bulletin of the Mizunami Fossil Museum*, 32, 227–234.
Hayashi, M., Yahiro, K., Kitamura, N. & Kitabayashi, E. (2004) Middle Pleistocene fossil insects from the Tsumori Formation of Mashiki-machi, Mumamoto Prefecture Japan (Part 2). *Bulletin of the Mizunami Fossil Museum*, 31, 63–67.
Hayashi, M., Yashiro, K. & Kitabayashi, E. (2008) Middle Pleistocene fossil insects from the Saijo Formation of Higashi-Hiroshima City, Hiroshima Prefecture, Japan. *Bulletin of the Mizunami Fossil Museum*, 34, 89–93.
Hayashi, M., Yashiro, K. & Kitabayashi, E. (2009) Middle Pleistocene fossil insects from the Nogami Formation of Kokonoe, Oita Prefecture, Kyushu, Japan. *Bulletin of the Mizunami Fossil Museum*, 35, 105–110.
Heer, O. (1849) *Die Insektenfauna der Tertiärgebilde von Oeningen und von Radoboj in Croatien*, Vol. 2. Wilhelm Engelmann, Leipzig, 264 pp.
Heer, O. (1856) Ueber die fossilen Insekten von Aix in der Provence. *Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich*, 1, 1–40.
Heer, O. (1861) *Recherches sur le Climat et la Végétation du Pays Tertiaire*. Winterthur, Geneve & Paris, 220 pp.
Heer, O. (1865) *Die Urwelt der Schweiz*. Friedrich Schultheß, Zürich, 622 pp.
Heer, O. (1876) *The Primaeval World of Switzerland*, Vol. 2. Longmans, Green, and Co., London, 324 pp.
Heie, O.E. & Lutz, H. (2002) Fossile Aphiden aus den frühen Oligozän-Ablagerungen bei Céreste, Frankreich, mit Beschreibungen neuer Gattungen und Arten (Hemiptera: Sternorrhyncha: Aphidoidea). *Mainzer Naturwissenschaftliches Archiv*, 40, 113–122.
Helm, O. (1899) Insekteneinschlüsse in Gedanit. *Schriften der Naturforschenden Gesellschaft in Danzig*, 10, 38.
Hemming, F. (1967) Generic names of Butterflies of the World and their Type-species (Lepidoptera : Rhopalocera). *Bulletin of the British Museum of Natural History (Entomology) Supplement*, 9, 509 pp.
Henriksen, K.L. (1922) Eocene Insects from Denmark. *Danmarks geologiske Undersogelse* 2(37): 1–36.
Henriksen, K.L. (1933) Undersøgelser over Danmark-Skånes kvartaere Insektfauna. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening*, 96(2), 77–355, pl. 6–10.
Hentoray, M.-H. (1986) Decouverte d'un nouveau gisement de Lepidopteres, d'autres insectes et d'araignees fossiles a Dauphin (Hte Provence, France). *Linneana Belgica*, 10(6), 266–279.
Hermsen, E.J. & Hendricks, J.R. (2007) A method for constraining the age of origination of derived characters. *Cladistics*, 22, 1–11.
Heyden, C. (1862) Gliederthiere aus der Braunkohle des Niederrhein's, der Wetterau und der Röhn. *Palaeontographica*, 10, 62–82.
Hickey, L.J. & Hodges, R.W. (1975) Lepidopteran leaf mine from the Early Eocene Wind River Formation of northeastern Wyoming. *Science*, 189(4204), 718–720.
Heie, O.E. & Lutz, H. (2002) Fossile Aphiden aus den frühen Oligozän-Ablagerungen bei Céreste, Frankreich, mit Beschreibungen neuer Gattungen und Arten (Hemiptera: Sternorrhyncha: Aphidoidea). *Mainzer naturwissenschaftliches Archiv*, 40, 113–122.
Hiura, I. & Miyatake, Y. (1974) On the fossil Arthropoda in Mizunami amber from Gifu Prefecture (Pleistocene). *Bulletin of the Mizunami Fossil Museum*, (1), 385–392.
Hill, A. (1987) Damage to some fossil bones from Laetoli. *In*: Leakey, M.D. & Harris, J.M. (Eds.), *Laetoli. A Pliocene Site in*

Northern Tanzania. Clarendon Press, Oxford, pp. 543–545.
Hoffeins, C. & Hoffeins, H.W. (2003) Untersuchungen über die Häufigkeit von Inklusen in baltischen und bitterfelder Bernstein (Tertiär, Eozän) aus unselektierten Aufsammlungen unter besonderer Berücksichtigung der ordnung Diptera. *Studia Dipterologica*, 10(2), 381–392.
Holst, N.O. (1908) Efferskörd från de senglaciala lagren vid Toppeladugård. Sveriges Geologiska Undersköning. *Afhandlingar och Uppsatser C*, 210, 1–5.
Hong, Y.-C. (1984) Curvicubitidae fam. nov. (Lepidoptera? Insecta) from Middle Triassic of Shaanxi. *Acta Palaeontologica Sinica*, 23(6), 782–785.
Hope, F.W. (1836) Observations on Succinic Insects. *Transactions of the Entomological Society of London*, 1, 133–147.
Huang, D., Nel, A. & Minet, J. (2010) A new family of moths from the Middle Jurassic (Insecta: Lepidoptera). *Acta Geologica Sinica*, 84(4), 874–885.
Hurd, P.D.J. & Smith, R.F. (1957) The meaning of Mexico's amber. *Pacific Discovery*, 10(2), 6–7.
Hurd, P.D.J., Smith, R.F. & Durham, J.W. (1962) The fossiliferous amber of Chiapas, Mexico. *Ciencia*, 21(3), 108–118.
ICZN (International Commission on Zoological Nomenclature) (1999) *International Code of Zoological Nomenclature*, 4th ed. The International Trust for Zoological Nomenclature, London, 306 pp.
Iversen, J. (1934) Moorgeologische Untersuchungen auf Grönland. Ein Beitrag zur Beleuchtung der Ursachen des Unterganges der mittelalterlichen Nordmännerkultur. *Meddelelser fra Dansk Geologisk Forening*, 8, 341–358.
Jahn, M. & Woolf, D.J. (1963) *The Lying Stones of Dr. Johann Bartholomew Adam Beringer: Being his Lithographiæ Wirceburgensis*. University of California Press, Berkeley, 221 pp.
Jarzembowski, E.A. (1976) Report of Easter Field Meeting: the Lower Tertiaries of the Isle of Wight, 27–31.III.1975. *Tertiary Research*, 1(1), 11–16.
Jarzembowski, E.A. (1980) Fossil insects from the Bembridge Marls, Palaeogene of the Isle of Wight, southern England. *Bulletin of the British Museum of Natural History (Geology)*, 33(4), 237–293.
Jarzembowski, E.A. (1989) A century plus of fossil insects. *Proceedings of the Geologists' Association*, 100(4), 433–449.
Jarzembowski, E.A. (1995) Checklist of Tertiary insects from Dorset. *Proceedings of the Dorset Natural History and Archaeological Society*, 116, 145–146.
Joseph, N.C. (1986) Eocene flora and fauna unearthed at Republic. *Washington Geologic Newsletter*, 14(4), 3–5.
Kapoor, V.C. (1981) *Origin and Evolution of Insects*. Kalyani Publishers, New Delhi & Ludhiana, 144 pp.
Kawahara, A.Y. (2009) Phylogeny of snout butterflies (Lepidoptera: Nymphalidae: Libytheinae): combining evidence from the morphology of extant, fossil, and recently extinct taxa. *Cladistics*, 25, 263–278.
Kawall, J.H. (1876) Organische Einschlüsse im Bergkrystall. *Bulletin de la Société entomologique de Moscou*, 51, 170–173.
Keble, R.A. (1947) Notes on Australian Quaternary climates and migration. *Memoirs of the National Museum of Victoria Melbourne*, (15), 28–81.
Keilbach, R. (1982) Bibliographie und Liste der Arten tierischer Einschlüsse in fossilen Harzen sowie ihrer Aufbewahrungsorte. *Deutsche Entomologische Zeitschrift, N. F.*, 29(4/5), 301–491.
Kemna, H.A. (2008) A Revised Stratigraphy for the Pliocene and Lower Pleistocene Deposits of the Lower Rhine Embayment. *Netherlands Journal of Geosciences*, 87(1), 91–105.
Kernbach, K. (1967) Über die bisher im Pliozän von Willershausen gefundenen Schmetterlings- und Raupenreste. *Bericht der Naturhistorischen Gesellschaft zu Hannover*, 111, 103–108.
Kitching, I.J. & Sadler, S. (2011) Lepidoptera, Insecta. *In*: Harrison, T. (Ed.), *Paleontology and Geology of Laetoli: Human Evolution in Context*, Vol. 2: Fossil Hominins and the Associated Fauna. Springer, Dordrecht, Heidelberg, London & New York, pp. 549–554.
Kinzelbach, R.K. (1970) Eine Gangmine aus dem eozänen Ölshiefer von Messel (Insecta: ?Lepidoptera). *Paläontologische Zeitschrift*, 44(1/2), 93–96.
Kirby, W.F. (1871) *A Synonymic Catalogue of Diurnal Lepidoptera*. J. Van Voorst, London, viii+690 pp.
Kirby, W.F. (1872) *A Synonymic Catalogue of Diurnal Lepidoptera*. Supplement. J. Van Voorst, London, pp. 691–882.
Klebs, R. (1890) Ueber die Fauna des Bernsteins. *Versammlung Deutscher Naturforscher und Ärzte in Heidelberg*, 18(23), 268–271.
Kluge, N.J. (2004) *The Phylogenetic System of Ephemeroptera*. Kluwer Academic Publishers, Dordrecht, 456 pp.
Knowlton, F.H. (1917) A fossil flora from the Frontier Formation of southwestern Wyoming. *United States Geological Survey Professional Paper*, 108, 73–95, pls. 1–39.
Kolbe, H. (1932) Fossile Coleopteren aus präglazialer Zeit Südschwedens. *Entomologiske Meddelelser*, 18, 208–214.
Koponen, M. & Nuorteva, M. (1973) Über subfossile Waldinsekten aus dem Moor Piionsuo in Südfinnland. *Acta Entomologica Fennica*, 29, 1–84.
Kosmowska-Ceranowicz, B. (1996) Zbiory bursztynu w Muzeum Przyrodniczym we Lwowie, dawnym Muzeum im. Dzieduszyckich. *Prace Muzeum Ziemi*, 44, 55–60.
Kosmowska-Ceranowicz, B. & Popiolek, J. (1981) On amber collections in Poland on the basis of unpublished Adam Chetnik's manuscripts from 1951–1958. *Prace Muzeum Ziemi*, 34, 1–29.
Kozhanchikov, I.V. (1957) Novyy Predstavitel' Sem. Cossidae Iz Miotsenovikh Otlozhenyy Kavkaza (Lepidoptera, Insecta). *Doklady Akademiya Nauk SSSR*, 113(3), 675–677.
Kozlov, M.V. (1987) Noviye Molevidniye Cheshuyekriliye iz Baltiiskogo Yantarya. *Paleontological Journal*, 1987(4), 59–67.

Kozlov, M.V. (1988) Paleontology of lepidopterans and problems of the phylogeny of the order Papilionida. *In*: Ponomarenko, A.G. (Ed.), *The Mesozoic–Cenozoic Crisis in the Evolution of Insects*. Academy of Sciences, Moscow, pp. 16–69.
Kozlov, M.V. (1989) New Upper Jurassic and Lower Cretaceous Lepidoptera (Papilionida). *Paleontological Journal*, 23(4), 34–39.
Kozlov, M.V., Ivanov, V.D. & Rasnitsyn, A.P. (2002) Order Lepidoptera Linné, 1758. The butterflies and moths (= Papilionida Laicharting, 1781). *In*: Rasnitsyn, A.P. & Quicke, D.L.J. (Ed.), *History of Insects*. Kluwer Academic Publishers, Dordrecht, Boston & London, pp. 220–227.
Krassilov, V.A. (2007) Mines and galls on fossil leaves from the Late Cretaceous of southern Negev, Israel. *African Invertebrates*, 48 (1), 13–22.
Krassilov, V. & Shuklina, S. (2008) Arthropod trace diversity on fossil leaves from the mid-Cretaceous of Negev, Israel. Alavesia, 2, 239–245.
Kristensen, N.P. (Ed.) (1998) Lepidoptera, Moths and Butterflies Vol. 1: Evolution, Systematics, and Biogeography. *Handbook of Zoology*, Vol. IV Arthropoda: Insecta, Part 35. Walter de Gruyter, Berlin & New York, 487 pp.
Kristensen, N.P. (2003) Appendices. *In*: Kristensen, N. P. (Ed.), Lepidoptera, Moths and Butterflies, Vol. 2: Morphology, Physiology, and Development. *Handbook of Zoology*, Vol. IV Arthropoda: Insecta, Part 36. Walter de Gruyter, Berlin, pp. 545–554.
Kristensen, N.P. & Nielsen, E.S. (1979) A new subfamily of micropterigid moths from South America. A contribution to the morphology and phylogeny of the Micropterigidae, with a generic catalogue of the family (Lepidoptera: Zeugloptera). *Steenstrupia*, 5(7), 69–147.
Kristensen, N.P. & Skalski, A.W. (1998) Phylogeny and palaeontology. *In*: Kristensen, N.P. (Ed.), Lepidoptera, Moths and Butterflies, Vol. 1: Evolution, Systematics, and Biogeography. *Handbook of Zoology*, Vol. IV Arthropoda: Insecta, Part 35. Walter de Gruyter, Berlin & New York, pp. 7–25.
Kristensen, N.P., Scoble, M. & Karsholt, O. (2007) Lepidoptera phylogeny and systematics: the state of inventorying moth and butterfly diversity. *Zootaxa*, 1668, 699–747.
Kuhn, O. (1951) Ein vermutlicher Schmetterling, *Geisfeldiella benkerti* n. g. n. sp. aus dem Lias ε_1 Nordfrankens. *Neues Jahrbuch für Geologie und Paläontologie. Monatshefte*, 2, 58–61.
Kühne, W.G., Kubig, L. & Schlüter, T. (1973) Eine Micropterygide (Lepidoptera, Homoneura) aus mittelcretazischem Harz Westfrankreichs. *Mitteilungen der Deutschen Entomologischen Gesellschaft*, 32, 61–64.
Kunz, P. (2010) 30 ans déjà. *ASAM Bulletin*, 2010, 39–45.
Kupryjanowicz, J. (2001) Arthropods in Baltic amber and their photographic record. *In*: Kosmowska-Ceranowicz, B. (Ed.), The Amber Treasure Trove, Part I. The Tadeusz Giecewicz's collection at the Museum of the Earth, Polish Academy of Science, Warsaw. *Museum of the Earth Documentary Studies*, 18, 19–59.
Kuroko, H. (1987) A fossil leaf mine of Nepticulidae (Lepidoptera) from Japan. *Bulletin of the Sugadaira Montane Research Center*, 8, 119–121.
Kurz, M.A. & Kurz, M.E. (2010) *Micropterix gertraudae* Kurz M. A. & M. E. Kurz, 2010. Taxonomy Online. Available from http://www.nkis.info/nkis/extaustaxonshow.cgi?uid=guest&tax=161783&lang=e/ (accessed 13 August 2011).
Kusnezov, N. (1928) *Oligamatites martynovi*, gen. et sp. n., a fossil amatid lepidopteron from the Oligocene beds of Central Asia. *Doklady Akademiya Nauk SSSR*, 20(4), 431–436.
Kusnezov, N. (1941) *A Revision of Amber Lepidoptera*. Paleontological Institute, USSR Academy of Sciences, Moscow & Leningrad, 135 pp.
Labandeira, C.C. (1994) A compendium of fossil insect families. *Milwaukee Public Museum Contributions in Biology and Geology*, (88), 1–71.
Labandeira, C.C. (1998a) The role of insects in Late Jurassic to middle Cretaceous Ecosystems. Lower and Middle Cretaceous Terrestrial Ecosystems. *New Mexico Museum of Natural History and Science Bulletin*, 14, 105–124.
Labandeira, C.C. (1998b) Plant-Insect associations from the fossil record. *Geotimes*, 43, 18–24.
Labandeira, C.C. (1998c) Early history of arthropod and vascular plant associations. *Annual Review of Earth and Planetary Sciences,* 26, 329–377.
Labandeira, C.C. (1999) Insects and other hexapods. *In*: Singer, R. (Ed.), *Encyclopedia of Paleontology*. Fitzroy Dearborn, Chicago, pp. 603–624.
Labandeira, C.C. (2002a) Paleobiology of middle Eocene plant-insect associations from the Pacific Northwest: A preliminary report. *Rocky Mountain Geology*, 37(1), 31–59.
Labandeira, CC. (2002b) The history of associations between plants and animals. *In*: Herrera, C.M. & Pellmyr, O., (Eds.), *Plant–Animal Interactions: An Evolutionary Approach*. Blackwell Science, London, pp. 28–74, 248–261.
Labandeira, C.C., Dilcher, D.L., Davis, D.R. & Wagner, D.L. (1994) Ninety-seven million years of angiosperm-insect association: Paleobiological insights into the meaning of coevolution. *Proceedings of the National Academy of Sciences, USA*, 91, 12278–12282.
Labandeira, C.C., Johnson, K.R. & Lang, P.J. (2002a) Preliminary assessment of insect herbivory across the Cretaceous–Tertiary boundary: Major extinction and minimum rebound. *In*: Hartman, J.H., Johnson, K.R. & Nichols, D.J. (Eds.), The Hell Creek Formation and the Cretaceous–Tertiary Boundary in the Northern Great Plains. *Geological Society of America Special Paper*, 361, 297–327.
Labandeira, C.C., Johnson, K.R. & Wilf, P. (2002b) Impact of the terminal Cretaceous event on plant-insect associations. *Pro-*

ceedings of the National Acadmy of Sciences, USA, 99(4), 2061–2066.
Labandeira, C.C., & Sepkoski, J.J., Jr. (1993) Insect diversity in the fossil record. *Science*, 261, 310–315.
Lamba, B.S. (1944) A preliminary note on the age of the saline series in the Punjab Salt Range. *Current Science*, 13, 258.
Lancucka-Srodoniowa, M. (1964) Tertiary coprolites imitating fruits of the Araliaceae. *Acta Societatis Botanicorum Poloniae*, 33(2), 469–473.
Lang, P.J., Scott, A.C. & Stephenson, J. (1995) Evidence of plant-arthropod interactions from the Eocene Branksome Sand Formation, Bournemouth, England: Introduction and description of leaf mines. *Tertiary Research*, 15(4), 145–174.
Larsson, S.G. (1962) The Copenhagen collection of amber-fossils. *Entomologiske Meddelelser*, 31(4), 323–326.
Larsson, S.G. (1965) Reflections on the Baltic amber inclusions. *Entomologiske Meddelelser*, 34(2), 135–142.
Larsson, S.G. (1975) Paleobiology and mode of burial of the insects of the Lower Eocene Mo-clay of Denmark. *Bulletin of the Geological Society of Denmark*, 24, 193–209.
Larsson, S.G. (1978) Baltic Amber —a Palaeobiological Study. *Entomonograph*, Vol. 1. Scandinavian Science Press Ltd., Klampenborg, 187 pp.
Laurentiaux, D. (1953) Classe des Insectes. *In*: Piveteau, J. (Ed.), *Traité de Paléontologie*, Vol. 3. Masson et Cie, Paris, pp. 397–527.
Leakey, L.S.B. (1952) Lower Miocene invertebrates from Kenya. *Nature*, 169(4302), 624–625.
Leestmans, R. (1983) Les lépidoptères fossiles trouvés en France (Insecta Lepidoptera). *Linneana Belgica*, 9(1), 64–89.
Lefebvre, M.A. (1851) Relatives a l'empreinte d'un Lépidoptère fossile (*Cyllo Sepulta*) du Docteur Boisduval. *Annales de la Société Entomologique de France*, (2)9, 71–88, pl. 3.
Lemdahl, G. (2000) Late Glacial and Early Holocene insect assemblages from sites at different altitudes in the Swiss Alps —implications on climate and environment. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 159, 293–312.
Lewis, S.E. (1976) Lepidopterous feeding damage of live oak leaf (*Quercus convexa* Lesquereux) from the Ruby River Basin (Oligocene) of southwestern Montana. *Journal of Paleontology*, 50(2), 345–346.
Lewis, S.E. (1969) Lepidopterous larval-mining of an oak (?) leaf from the Latah Formation (Miocene) of eastern Washington. *Annals of the Entomological Society of America*, 62(5), 1210–1211.
Lewis, S.E. (1985) Miocene insects from the Clarkia deposits of northern Idaho. *In*: Smiley, C.J. (Ed.), *Late Cenozoic History of the Pacific Northwest*. American Association for the Advancement of Science, Pacific Division, pp. 245–264.
Lewis, S.E. (1989) Miocene insect localities in the United States. *Occasional Papers in Paleobiology, St. Cloud State University*, 3(4), 1–13.
Lewis, S.E. (1992) Insects of the Klondike Mountain Formation, Republic, Washington. *Washington Geology*, 20(3), 15–19.
Liebhold, A.M., Voney, W.J.A. & Schorn, H.E. (1982) An unidentified leaf mine in fossil *Mahonia reticulata* (Berberidaceae). *The Canadian Entomologist*, 114, 455–456.
Lindberg, H. (1900) Suomen turvesuot. *Suomen suoviljelysyhdistyksen vuosikirja*, 1900, 184–257.
Łomnicki, A.M. (1894) *Fauna Pleistocenica Insectorum Boryslaviensium*. Musaeum Dzieduszyckianum, Lvov, 116 pp.
Lukashevich, E.D. (1996) New chaoborids from the Mesozoic of Mongolia (Diptera: Chaoboridae). *Palaeontological Journal*, 30(5), 551–558.
Maa, T. (1949) A synopsis of Asiatic Siricoidea with notes on certain exotic and fossil forms (Hymenoptera Symphyta). *Notes d'Entomologie Chinoise* 13(2): 11–189.
Mabberley, D.J. (1993) *The Plant Book: A Portable Dictionary of the Higher Plants.* Cambridge University Press, Cambridge, xii+707 pp.
MacKay, M.R. (1969) Microlepidopterous larvae in Baltic amber. *Canadian Entomologist*, 101(11), 1173–1180.
Martínez-Delclós, X., Arillo, A., Ortuño, V. & Peñalver, E. (1999) El ámbar del Cretácico Inferior de Peñacerrada (Álava, España). *Temas Geológico-Mineros ITGE*, 26, 13–17.
Martínez-Delclós, X., Briggs, D.E.G. & Peñalver, E. (2004) Taphonomy of insects in carbonates and amber. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 203, 19–64.
Martins-Neto, R.G. (1989) Novos insetos Terciários do Estado de São Paulo. *Revista Brasileira de Geociências*, 19(3), 375–386.
Martins-Neto, R.G. (1998a) A paleontomofauna da Formação Tremembé (Bacia de Taubaté), Oligoceno do Estado de São Paulo: descrição de novos lepidópteros (Insecta). *Acta Geologica Leopoldensia*, 41(46/47), 75–82.
Martins-Neto, R.G. (1998b) A paleoentomofauna da Formação Tremembé (Bacia de Taubaté) Oligoceno do Estado de São Paulo: novos Hemiptera, Auchenorrhyncha, Hymenoptera, Coleoptera e Lepidoptera (Insecta). *Revista Universidade Guarulhos, Geociências*, 3(6), 58–70.
Martins-Neto, R.G. (1999) New genus and new species of Lepidoptera (Insecta, Eolepidopterigidae) from Santana Formation (Lower Cretaceous, northeast Brazil). *Boletim do 5th Simpósio sobre o Cretáceo do Brasil*, 1999, 531–535.
Martins-Neto, R.G. (2002) *Insetos Fósseis como Bioindicadores em Depósitos Sedimentares: um Estudo de Caso para o Mesozóico Sul-Americano*. Doctoral Thesis, Departamento de Geologia, Universidade do Vale do Rio dos Dinos, Porto Alegra, Brasil, 214 pp.
Martins-Neto, R.G. (2005) Estágio atual da Paleoartropodologia Brasileira: Hexápodes, Miriápodes, Crustáceos (Isopoda, Decapoda, Eucrustacea e Copepoda) e Quelicerados. *Arquivos do Museu Nacional, Rio de Janeiro*, 63(3), 471–494.
Martins-Neto, R.G. & Vulcano, M.A. (1989) Amphiesmenoptera (Trichoptera + Lepidoptera) na Formação Santana (Cretáceo Inferior) Bacia do Araripe, Nordeste do Brasil. I. Lepidoptera (Insecta). *Anais da Academia Brasileira de Ciências*, 61(4),

459–466.
Martins-Neto, R.G., Kucera-Santos, J.C., de Moraes Vieira, F.R. & de Campos Fragoso, L.M. (1993) Nova espécie de borboleta (Lepidoptera: Nymphalidae: Satirynae [sic]) da Formação Tremembé, Oligoceno do Estado de São Paulo. *Acta Geologica Leopoldensia*, 16, 5–16.
Mathewes, R.W. & Brooke, R.C. (1971) Fossil Taxodiaceae and new angiosperm macrofossils from Quilchena, British Columbia. *Syesis*, 4, 209–216.
McCobb, L.M.E., Duncan, I.J., Jarzembowski, E.A., Stankiewicz, B.A., Wills, M.A. & Briggs, D.E.G. (1998) Taphonomy of the insects from the Insect Bed (Bembridge Marls), late Eocene, Isle of Wight, England. *Geological Magazine*, 135(4), 553–563.
McElwaine, J.C. (1998) Do fossil plants signal palaeoatmospheric CO_2 concentration in the geological past? *Philosophical Transactions of the Royal Society B*, 353, 83–96.
McNamara, M., Briggs, D.E.G., Orr, P. J., Wedmann, S., Noh, H. & Cao, H. (2011) Fossilized biophotonic nanostructures reveal the original colors of 47-million-year-old moths. *PLoS Biology*, 9 (11), e1001200.
Menge, A. (1856) *Lebenszeichen Vorweltlicher, im Bernstein Eingeschlossener Thiere*. Programm der öffentlichen Prüfung der Schüler der Petrischule. A.W. Kafemann, Danzig, 32 pp.
Mérit, X. & Mérit, M. (2008) *Problongos baudiliensis* genus novus & species nova : un nouveau Lépidoptère fossile découvert dans la diatomite du miocène supérieur de Saint-Bauzile (Ardèche, F-07) (Lepidoptera, Geometridae, Ennominae). *Revue des Lépidoptéristes de France*, 17(39), 29–33.
Meunier, F. (1902) Una nueva Cicada del Kimeridgense en el Montsech Provincia de Lérida (Cataluña). *Memorias de la Real Academia de Ciencias y Artes de Barcelona*, 4(18), 9–14.
Mey, W. (2011) On the systematic position of *Baltimartyria* Skalski, 1995 and description of a new species from Baltic amber (Lepidoptera, Micropterigidae). *Zookeys*, 130, 331–342.
Meyer, H.W. (2003) *The Fossils of Florissant*. Smithsonian Books, Washington & London, 258 pp.
Miki, S. (1937) Plant fossils from the Stegodon Beds and the Elephas Beds near Akashi. *Japanese Journal of Botany*, 8(4), 303–341, pl. 8–9.
Miller, J.Y. & Brown, F.M. (1989) A new Oligocene fossil butterfly, *Vanessa amerindica* (Lepidoptera: Nymphalidae), from the Florissant Formation, Colorado. *Bulletin of the Allyn Museum*, 126, 1–9.
Minot, C.S. (1886) Zur Kentniss der Insektenhaut. *Archiv für Mikroskopische Anatomie*, 28, 37–47.
Morlan, R.H. & Matthews, J.V. (1983) Taphonomy and paleoecology of fossil insect assemblages from Old Crow River (CRH-15) Northern Yukon Territory, Canada. *Géographie physique et Quaternaire*, 37 (2), 147–157.
Müller, A.H. (1982) Über Hyponome fossiler und rezenter Insekten, erster Beitrag. *Freiberger Forschungshefte C*, 366, 7–27.
Mueller, W.P. (1964) The distribution of cladoceran remains in surficial sediments from three northern Indiana lakes. *Investigations of Indiana Lakes and Streams*, 6(1), 1–63.
Nekrutenko, Y.P. (1965a) A new Tertiary nymphalid (Lepidoptera, Rhopalocera). *Paleontologicheski Zhurnal*, 4, 97–99.
Nekrutenko, Y.P. (1965b) Tertiary nymphalid butterflies and some phylogenetic aspects of systematic lepidopterology. *Journal of Research on the Lepidoptera*, 4(3), 149–158.
Nel, A. & Descimon, H. (1994) Une nouvelle espèce de Lèpidoptère fossile du Stampien de Cèreste (04) (Lepidoptera–Satyridae). *Gèologie Mèditerranèenne*, 11(4), 287–293.
Nel, A. & Nel, J. (1985) A propos de chenilles et de chrysalides fossiles du Stampien en France. *Alexanor*, 14(3), 126–130.
Nel, A. & Nel, J. (1986) A propos de deux Lépidoptères fossiles du Stampien d'Aix-en-Provence (Lepidoptera, Hesperiidae et Nymphalidae Satyrinae). *Bulletin du Muséum National d'Histoire Naturelle, Paris*, (4), 8(3), 343–350.
Nel, A., Nel, J. & Balme, C. (1993) Un nouveau lépidoptère Satyrinae fossile de l'Oligocene du sud-est de la France (Insecta, Lepidoptera, Nymphalidae). *Linneana Belgica*, 14(1), 20–36.
Néraudeau, D., Perrichot, V., Dejax, J., Masure, E., Nel, A., Philippe, M., Moreau, P., Guillocheau, F. & Guyot, T. (2002) A new fossil locality with insects in amber and plants (likely uppermost Albian): Archingeay (Charente-Maritime, France). *Geobios*, 35, 233–240.
Nielsen, E.S. & Kristensen, N.P. (1996) The Australian moth family Lophocoronidae and the basal phylogeny of the Lepidoptera–Glossata. *Invertebrate Taxonomy*, 10, 1199–1302.
Nieukerken, E.J. van, Kaila, L., Kitching, I.J., Kristensen, N. P., Lees, D.C., Minet, J., Mitter, C., Mutanen, M., Regier, J.C., Simonsen, T.J., Wahlberg, N., Yen, S.-H., Zahiri, R., Adamski, D., Baixeras, J., Bartsch, D., Bengtsson, B.A., Brown, J.W., Bucheli, S.R., Davis, D.R., De Prins, J., De Prins, W., Epstein, M.E., Gentili-Poole, P., Gielis, C., Hattenschwiler, P., Hausmann, A., Holloway, J.D., Kallies, A., Karsholt, O., Kawahara, A., Koster, J.C., Kozlov, M., Lafontaine, J.D., Lamas, G., Landry, J.-F., Lee, S., Nuss, M., Park, K.-T., Penz, C., Rota, J., Schmidt, B.C., Schintlmeister, A., Sohn, J.-C., Solis, M.A., Tarmann, G.M., Warren, A.D., Weller, S., Yakovlev, R.V., Zolotuhin V.V. & Zwick, A. (2011) Order Lepidoptera Linnaeus, 1758. *In*: Zhang, Z.-Q. (Ed.), Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness. *Zootaxa*, 3148, 212–221.
Nudds, J.R. & Selden, P.A. (2008) *Fossil Ecosystems of North America*. A Guide to the Sites and Their Extraordinary Biotas. University of Chicago Press, Chicago, 288 pp.
Nuorteva, M. & Kinnunen, K.A. (2008) Insect frass in Baltic amber. *Bulletin of the Geological Society of Finland*, 80, 105–124.
Nye, I.W.B. (1975) *The Generic Names of Moths of the World*, Vol. 1. Noctuoidea (part): Noctuidae, Agaristidae, and Nolidae.

Trustees of the British Museum (Natural History), London, 568 pp.
Ollerton, J. (1999) La evolución de las relaciones polinizador-planta en los artrópodos. *Boletin de la Sociedad Entomológica Aragonesa*, 26, 741–758.
Opler, P.A. (1973) Fossil lepidopterous leaf mines demonstrate the age of some insect-plant relationships. *Science*, 179, 1321–1323.
Opler, P.A. (1974) Biology, ecology, and host specificity of Microlepidoptera associated with *Quercus agrifolia* (Fagaceae). *University of California Publications in Entomology*, 75, 83 pp., 7 pls.
Opler, P.A. (1982) Fossil leaf-mines of *Bucculatrix* (Lyonetiidae) on *Zelkova* (Ulmaceae) from Florissant, Colorado. *Journal of the Lepidopterists' Society*, 36(2), 145–147.
Oppenheim, P. (1885) Die Ahnen unserer Schmetterlinge in der Sekundär- und Tertiärperiode. *Berliner Entomologische Zeitschrift*, 29(2), 331–349, pl. 10–12.
Oppenheim, P. (1888) Die Insectenwelt des lithographischen Schiefers in Bayern. *Palaeontographica*, 34, 215–247.
Oustalet, M.E. (1870) Recherches sur les Insectes Fossiles des Terrains Tertiaires de la France. *Annales des Sciences Géologiques*, 2, 1–175.
Pearson, R.C. & Obradovich, J.D. (1977) Eocene rocks in northeast Washington, Radiometric ages and correlations. *U.S. Geological Survey Bulletin*, 1433, 41 pp.
Peñalver, E. (1997) Hojas fósiles del Terciaro de Teruel con marcas de herbivorismo debidas a orugas. *Boletin de la Sociedad Entomologica Aragonesa*, 19, 29–33.
Peñalver, E. & Delclós, X. (2004) Insectos del Mioceno inferior de Ribesalbes (Castellón, España). Interacciones planta-insecto. *Treballs del Museu de Geologia de Barcelona*, 12, 69–95.
Peñalver, E. & Engel, M.S. (2006) Two wasp families rare in the fossil record (Hymenoptera): Perilampidae and Megaspilidae from the Miocene of Spain. *American Museum Novitates*, (3540), 12 pp.
Peñalver, E. & Grimaldi, D.A. (2006) New data on Miocene butterflies in Dominican amber (Lepidoptera: Riodinidae and Nymphalidae) with the description of a new nymphalid. *American Museum Novitates*, 3519, 1–17.
Perkins, M.E., Brown, F.H., Nash, W.P., McIntosh, W. & Williams, S.K. (1998) Sequence, age and source of silicic fallout tuffs in middle to late Miocene basins of the northern Basin and Range province. *Geological Society of America Bulletin*, 110, 344–360.
Perkovsky, E.E., Zosimovich, V.Y. & Vlaskin, A.Y. (2003) Rovno amber fauna: a preliminary report. *In*: Krzemińska, E. & Krzemiński, W. (Eds.), Proceedings of the Second Congress on Palaeoentomology "Fossil Insects". *Acta Zoological Cracoviensia*, 46(Supplement), 423–430.
Petrulevicius, J.F. & Martins-Neto, R.G. (2000) Checklist of South American Cenozoic insects. *Acta Geologica Hispanica*, 35(1/2), 135–147.
Pierce, W.D. (1945) Two new fossils from the Upper Miocene of the Puente Hills. *Bulletin, Southern California Academy of Sciences*, 44(1), 3–6.
Piton, L. (1936) Addition a la faune entomologique des cinerites du La Chambon (Puy-de -Dome). *Revue Scientifique du Bourbonnais et du Centre de la France*, 1936, 16–24.
Piton, L. (1940) *Paléontologie du Gisement Éocène de Menat (Puy-de-Dôme) (Flore et Faune)*. Imprimeries Paul Vallier, Clermont-Ferrand, 257 pp.
Poinar, Jr., G.O. (1992) *Life in Amber*. Stanford University Press, Stanford, 368 pp.
Poinar, Jr., G.O. & Brown, A.E. (2002) *Hymenaea mexicana* sp. nov. (Leguminosae: Caesalpinioideae) from Mexican amber indicates Old World connections. *Botanical Journal of the Linnean Society*, 139, 125–132.
Poinar, Jr., G.O. & Brown, J.W. (1993) A new fossil tortricid (Lepidoptera: Tortricidae) from Dominican amber. *Entomologica Scandinavica*, 23, 25–29.
Poinar, Jr., G.O. & Poinar, R. (2005) Fossil evidence of insect pathogens. *Journal of Invertebrate Pathology*, 89, 243–250.
Poinar, Jr., G.O., Treat, A.E. & Southcott, R.V. (1991) Mite parasitism of moths: Examples of palaeosymbiosis in Dominican amber. *Experientia*, 47, 210–212.
Pongrácz, A. (1928) Die fossilen Insekten von Ungarn, mit besonderer Berücksichtigung der Entwicklung der Europäischen Insekten-Fauna. *Annales Historico-Naturales Musei Nationalis Hungarici*, 25, 91–194.
Presl, J.S. (1822) Additamenta ad faunam protogaeam, sistens descriptiones aliquot animalium in succino inclusorum. *In*: Presl, J.S. & Presl, C.B. (Eds.), *Deliciae Pragensis, Historiam Naturalem Spectantes*. Calve, Prague, pp. 191–210.
Procaccini, V. (1842) Sugli entomoliti delle gessase Sinigagliesi. *Nuovi Annali delle Scienze Naturali*, 1842, 448–456.
Prokop, J. (2003) Remarks on palaeoenvironmental changes based on reviewed Tertiary insect associations from the Krušné hory piedmont basins and the České středhoří Mts in northwestern Bohemia (Czech Republic). *In*: Krzemińska, E. & Krzemiński, W. (Eds.), Proceedings of the Second Congress on Palaeoentomology "Fossil Insects". *Acta Zoological Cracoviensia*, 46(Supplement), 329–344.
Pyron, R.A. (2010) A likelihood method for assessing molecular divergence time estimates and the placement of fossil calibrations. *Systematic Biology*, 59, 185–194.
Raffray, M. (1875) "in Simon, M. E., Séance du 23 Juin 1875." *Annales de la Société Entomologique de France*, 5, 125–126.
Rambur, M. (1839) Bulletin entomologique. *Annales de la Société Entomologique de France*, 8, i–xviii.
Rasnitsyn, A.P. (1983) Pervaya nakhodka babochki yurskogo vozrasta. *Doklady Akademiya Nauk SSSR*, 269(2), 467–671.
Rasnitsyn, A.P. (1986) Review of the fossil Tiphiidae with description of a new species (Hymenoptera). *Psyche*, 93, 91–102.

Rasnitsyn, A.P. & Ross, A.J. (2000) A preliminary list of arthropod families present in the Burmese amber collection at the Natural History Museum, London. *Bulletin of the Natural History Museum, London (Geology)*, 56(1), 21–24.
Rasnitsyn, A.P. & Zherikhin, V.V. (2002) Appendix: Alphabetic list of selected insect fossil sites. Impression fossils. *In*: Rasnitsyn, A.P. & Quicke, D.L.J. (Ed.), *History of Insects*. Kluwer Academic Publishers, Dordrecht, Boston & London, pp. 437–444.
Rebel, H. (1898) Fossil Lepidopteren aus der Miocänformation von Gabbro. *Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften*, 107, 731–745.
Rebel, H. (1934a) Bernstein–Lepidopteren (aus der Sammlung Bachofen-Echt.). *Paleobiologica*, 6, 1–16, pl. 1.
Rebel, H. (1934b) Mikrolepidopteren aus dem baltischen Bernstein. *Forschungen und Fortschritte*, 10(80), 372–373.
Rebel, H. (1936) Mikrolepidopteren aus dem baltischen Bernstein. *Die Naturwissenschaften*, 24, 519–520.
Reid, C. & Reid, E.M. (1915) The Pliocene floras of the Dutch Prussian Border. *Mededeelingen van de Rijksopsporing van Delfstoffen*, (6), 1–178, pl. 1–20.
Reiss, H. (1936) Ein Zygaenenfund aus der Tertiärzeit. *Entomologische Rundschau*, 53(39), 554–556.
Richter, G. (1988) Problems in the analysis of stomach contents of Eocene mammals from the Messel oil shale-layers. *Courier Forschungsinstitut Senckenberg*, 107, 121–127.
Richter, G. & Storch, G. (1980) Beiträge zur Ernährungsbiologie eozäner Fledermäuse aus der "Grube Messel". *Natur und Museum*, 110(12), 353–367.
Riek, E.F. (1955) Fossil insects from the Triassic beds at Mt. Crosby, Queensland. *Australian Journal of Zoology*, 3, 654–691.
Riek, E.F. (1970) Fossil history. *In*: CSIRO, *The Insects of Australia*. Melbourne University Press, Melbourne, pp. 168–186.
Riek, E.F. (1976) A new collection of insects from the Upper Triassic of South Africa. *Annals of the Natal Museum*, 22(3), 791–820.
Rohdendorf, B.B. (1939) O Miotsenovoy Faune Nasekomykh Okrestnostey g. Voroshilovska. *Priroda*, 12, 85–88.
Rohdendorf, B.B. & Zehrikhin, V.V. (1974) Paleontology and nature conservation. *Priroda*, 705(5), 82–91.
Ross, A.J. (1998) *Amber: The Natural Time Capsule*. Harvard University Press, Cambridge, 73 pp.
Ross, A.J. & Jarzembowski, E.A. (1993) Arthropoda (Hexapoda; Insecta). *In*: Benton, M.J. (Ed.), *The Fossil Record 2*. Chapman and Hall, London, pp. 363–426.
Ross, A.J., Mellish, C., York, P. & Crighton, B. (2010) Burmese amber. *In*: Penny, D. (Ed.), *Biodiversity of Fossils in Amber from the Major World Deposits*. Siri Scientific Press, Manchester, pp. 208–235.
Rosenkjaer, H.N. (1906) *Fra det Underjordiske København*. Geologiske og historiske Undersøgelser, København, 148 pp.
Rozefelds, A.C. (1985) The first records of fossil leaf mining from Australia. *Hornibrook Symposium, New Zealand Geological Survey Record*, 9, 80–81.
Rozefelds, A.C. (1988a) Insect leaf mines from the Eocene Anglesea locality, Victoria, Australia. *Alcheringa*, 12, 1–6.
Rozefelds, A.C. (1988b) Lepidoptera mines in *Pachypteris* leaves (Corystospermaceae: Pteridospermophyta) from the Upper Jurassic/Lower Cretaceous Battle Camp Formation, north Queensland. *Proceedings of the Royal Society of Queensland*, 99, 77–81.
Rust, J. (1998a) Biostratinomie von Insekten aus der Fur-Formation von Dänemark (Moler, oberes Paleozän/unteres Eozän. *Paläontologische Zeitschrift*, 71(1/2), 41–58.
Rust, J. (1998b) Fossil insects from the Fur and Olst Formations ("Mo Clay") of Denmark (upper Paleocene/lowermost Eocene). *Proceedings of the First International Palaeoentomological Conference*, Moscow, AMBA Projects International, Bratislava, 135–139.
Rust, J. (1999) *Biologie der Insekten aus dem ältersten Tertiär Nordeuropas*. Unpublished Habilitation thesis, Biologische Fakultät der Georg-August, Universität Göttingen, 482 pp.
Rust, J. (2000a) Fossil record of mass moth migration. *Nature*, 405, 530–531.
Rust, J. (2000b) Massenflüge von Lepidopteren über die Nordsee im Alttertiär (Insecta, Lepidoptera). *Atalanta*, 31(3/4), 577–583.
Sahni, A. (1984) Cretaceous–Paleocene terrestrial faunas of India: Lack of endemism during drifting of the Indian Plate. *Science*, 226, 441–443.
Sanderson, M.W. & Farr, T.H. (1960) Amber with insect and plant inclusions from the Dominican Republic. *Science*, 131(3409), 1313.
Schlüter, T. (1974) Kritisches zum Nachweis von Schmetterings-schuppen aus einem fossilen Harz der mittleren Kreide Nordwestfrankreichs. *Entomologische Zeitschrift*, 84(23), 253–256.
Schlüter, T. (1975) Nachweis verschiedener Insecta-Ordines in einem mittelkretazischen Harz Nordwestfrankreichs. *Entomologica Germanica*, 1(2), 151–161.
Schlüter, T. (1997) Validity of the Paratrichoptera —an extinct insect order related to the Mecoptera, Diptera, Trichoptera or Lepidoptera? Suggestions based on discoveries in the Upper Triassic Molteno Formation of South Africa. *Berliner geowissenschaftliche Abhandlungen*, 25, 303–312.
Schlotheim, E.F. von (1820) *Die Petrfactenkunde auf ihrem jetzigen Standpunkte durch die Beschreibung seiner Sammlung versteinerter und fossiler Überreste des Thier- und Pflanzernreichs der Vorwelt erläutert*. Bekker'schen edit, Gotha, 457 pp.
Schöberlin, E. (1888) Der Oeninger Stinkschiefer und seine Insektenreste. *Societas Entomologica*, 3(9), 68–69.
Schröter, J.S. (1784) *Neue Litteratur und Beyträge zur Kenntniß der Naturgeschichte vorzüglich der Conchylien und Foßilien*,

Vol. 1. Müller, Leipzig, 550 pp.
Schüssler, H. (1933) Saturniidae: 1. Subfam. Attacinae. *In*: Strand, E. (Ed.), *Lepidopterum Catalogus*. W. Junk, Berlin, 769 pp.
Scott, A.C., Stephenson, J. & Chaloner, W.G. (1992) Interaction and coevolution of plants and arthropods during the Palaeozoic and Mesozoic. *Philosophical Transactions of the Royal Society of London B*, 335, 129–165.
Scudder, S.H. (1867) Results of an examination of a small collection of fossil insects obtained by Prof. Wm. Denton in the Tertiary beds of Green River, Colorado. *Proceedings of the Boston Society of Natural History*, 11, 117–118.
Scudder, S.H. (1868) The insects of ancient America. *The American Naturalist*, 1(12), 625–631.
Scudder, S.H. (1872) Description d'un nouveau papillon fossile (*Satyrites reynesii*) trouve a Aix en Provence. *Revue et Magasin de Zoologie*, (2)23, 66–72.
Scudder, S.H. (1875a) Historical sketch of the generic names proposed for butterflies: A contribution to systematic nomenclature. *Proceedings of the American Academy of Arts and Sciences, New Series*, 2, 91–293.
Scudder, S.H. (1875b) Fossil butterflies. *Memoirs of the American Association for the Advancement of Science*, 1, 1–99.
Scudder, S.H. (1877) The first discovered traces of fossil insects in the American Tertiaries. *Bulletin of the United States Geological Survey of the Territories*, 3(4), 741–762.
Scudder, S.H. (1878) An account of some insects of unusual interest from the Tertiary rocks of Colorado and Wyoming. *Bulletin of the United States Geological Survey of the Territories*, 4(2), 519–543.
Scudder, S.H. (1881) The Tertiary lake-basin at Florissant, Colorado, between South and Hayden Parks. *Bulletin of the United States Geological Survey of the Territories*, 6, 279–300.
Scudder, S.H. (1889) The fossil butterflies of Florissant. *Annual Report of the United States Geological Survey*, 8, 433–474.
Scudder, S.H. (1890) The Tertiary Insects of North America. *Report of the United State Geological Survey of the Territories*, 13, 1–734, pl. 1–28.
Scudder, S.H. (1891) Index to the known fossil insects of the World including myriapods and arachnids. *Bulletin of the United States Geological Survey*, 71, 1–744.
Scudder, S.H. (1892) Some insects of special interest from Florissant, Colorado, and other points in the Tertiaries of Colorado and Utah. *Bulletin of the United States Geological Survey*, 93, 5–35.
Sendelius, N. (1742) *Historia Succinorum Corpora Aliena Involventium et Naturae Opere, Pictorum et Caelatorum ex Augustorum I et II Cimeliis Dresdae Conditis Aeri Insculptorum Conscripta*. Fridericum Gleditschium, Lipsiae, 328 pp., 13 pls.
Shields, O. (1985) Southeast Asian affinities in Colorado Oligocene Libytheidae. *Tokurana Special*, 1, 13–24.
Skalski, A.W. (1973a) Studies on the Lepidoptera from fossil resins. Part II. *Epiborkhausenites obscurotrimaculatus* gen. et. sp. nov. (Oecophoridae) and a tineid-moth discovered in the Baltic amber. *Acta Palaeontologica Polonica*, 28(1), 153–160.
Skalski, A.W. (1973b) Studies on the Lepidoptera from fossil resins. Part VI. *Tortricidrosis inclusa* gen. et spec. nov. from the Baltic amber (Lep., Tortricidae). *Deutsche Entomologische Zeitschrift, N. F.*, 20(4/5), 339–344.
Skalski, A.W. (1974) Zwei neue Gattungen und Arten der Familie Tineidae aus dem Baltischen Bernstein. *Beiträge zur Entomologie*, 24(1/4), 97–104.
Skalski, A.W. (1976a) Les lépidoptères fossiles de l'ambre, Etat actuel de nos connaissances. *Linneana Belgica*, 6(7), 154–169.
Skalski, A.W. (1976b) Les lépidoptères fossiles de l'ambre, Etat actuel de nos connaissances (2^{me} partie). *Linneana Belgica*, 6(8), 195–208.
Skalski, A.W. (1976c) Les lépidoptères fossiles de l'ambre, Etat actuel de nos connaissances (3^{me} partie et fin). *Linneana Belgica*, 6(9), 221–233.
Skalski, A.W. (1977) Studies on the Lepidoptera from fossil resins. Part 1. General remarks and descriptions of new genera and species of the families Tineidae and Oecophoridae from the Baltic amber. *Prace Muzeum Ziemi*, 26, 3–24.
Skalski, A.W. (1979a) A new member of the Family Micropterigidae (Lepidoptera) from the Lower Cretaceous of Transbaikalia. *Paleontological Journal*, 13(2), 206–214.
Skalski, A.W. (1979b) Study on the Lepidoptera from fossil resins. Part VII. *Palaeodepressaria hannemanni* gen. et spec. nov (Oecophoridae) from the Baltic amber. *Prace Muzeum Ziemi*, 32, 101–107.
Skalski, A.W. (1979c) Records of oldest Lepidoptera. *Nota Lepidopterologica*, 2(1/2), 61–66.
Skalski, A.W. (1984) A new lower Cretaceous Lepidoptera (Homoneura). *Bulletin of the Polish Academy of Science, Biological Sciences*, 32(11/12), 389–394.
Skalski, A.W. (1985) Motyle (Lepidoptera) w bursztynie baltyckim. *Wiadomosci Entomologiczne*, 6(3/4), 207–210.
Skalski, A.W. (1988) *Stauropolia nekrutenkoi* gen. et. sp. n. (Lepidoptera, Arctiidae)–a new fossil Tiger-moth from Miocene of the Caucasus. *Vestnik Zoologii*, 1988(4), 21–25.
Skalski, A.W. (1990a) An annotated review of all fossil records of Lower Lepidoptera. *Bulletin of the Sugadaira Montane Research Center*, 11, 125–128.
Skalski, A.W. (1990b) The families Nepticulidae and Thyrididae in Baltic amber (Lepidoptera). Proceedings of the Seventh Congress of the Societas Europaea Lepidopterologica, Lunz. *Nota Lepidopterologica Supplement*, 4, 144–145.
Skalski, A.W. (1990c) Lepidoptera in fossil resins with emphasis on new investigations. *Prace Muzeum Ziemi*, 41, 163–164.
Skalski, A.W. (1992) Studies on the Lepidoptera from fossil resins. Part III. Two new genera and species of Tortricidae from the Baltic Amber. *Annals of the Upper Silesian Museum, Entomology*, 3, 137–146.
Skalski, A.W. (1995) Study on the Lepidoptera from fossil resins. Part XI. *Baltimartyria*, a new genus for *Micropteryx proavittella* Rebel, 1936, with redescription of this species (Lepidoptera, Zeugloptera, Micropterigidae). *Amber & Fossils*, 1(1), 26–37.

Skalski, A.W. & Veggiani, A. (1990) Fossil resin in Sicily and the northern Apennines: geology and organic content. *Praze Muzeum Ziemi*, 41, 37–49.
Smith, E.J.A. (1874) Discovery of remains of plants and insects. *Nature*, 11, 88.
Sobczyk, T. & Kobbert, M.J. (2009) Die Psychidae des baltischen Bernsteins. *Nota lepidopterologica*, 32(1), 13–22.
Sohn, J.-C., Labandeira, C., Davis, D. & Mitter, C. (2011) Lepidopteran fossil record: an overview of the known fossils and recent discoveries. *Abstracts of the 60th Annual Meeting of the Lepidopterists' Society*, Yale University, New Haven, pp. 8–9.
Sontag, E. (2004) Zbiory inkluzji zwierzecych w Muzeum Inkluzji w bursztynie Uniwersytetu Gdanskiego. *Prace Muzeum Ziemi*, 47, 91–92.
Spahr, U. (1989) Ergänzungen und Berichtigungen zu R. Keilbachs Bibliographie und Liste der Bernsteinfossilien–Überordnung Mecopteroidea. *Stuttgarter Beiträge zur Naturkunde Series B (Geologie und Paläontologie)*, 87(157), 1–87.
Stark, P. (1925) Die Moore des badischen Bodenseegebiets. I. Die nähere Umgebung von Konstanz. *Berichte der Naturforschenden Gesellschaft zu Freiburg i. Br.*, 24, 1–123.
Stephenson, J. (1991) *Evidence of Plant/Insect Interactions in the Late Cretaceous and Early Tertiary*. Ph. D. Thesis, Department of Geology, University of London, 378 pp.
Stephenson, J. & Scott, A.C. (1992) The geological history of insect-related plant damage. *Terra Nova*, 4, 542–552.
Stout, E.C., Beck, C.W. & Anderson, K.B. (2000) Identification of rumanite (Romanian amber) as thermally altered succinite (Baltic amber). *Physics and Chemistry of Minerals*, 27(9), 665–678.
Straus, A. (1976) Eine Gangmine im Eocän von Messel. *Aufschluß*, 27, 445–446.
Straus, A. (1977) Gallen, Minen und andere Fraßspuren im Pliozän von Willershausen am Harz. *Verhandlungen des Botanischen Vereins der Provinz Brandenburg*, 113, 43–80.
Swinton, A.H. (1881) A study of the variation of the Small Tortoiseshell Butterfly (*Vanessa urticae*). *Hardwicke's Science-Gossip*, 1881, 176–179.
Szafer, W. (1947) The Pliocene Flora of Krościenko in Poland II. Descriptive Part. *Rozprawy Wydzialu Matematyczno-Przyrodniczego Akademii Umiejetnos*, 72(2), 163–375, pl. 1–15.
Szafer, W. (1954) Pliocene flora from the vicinity of Czorsztyn (West Carpathians) and its relationship to the Pleistocene. *Instytut Geologiczny Prace*, 11, 1–238, 20 pls.
Szafer, W. (1961) Miocene flora from Stare Gliwice in Upper Silesia. *Instytut Geologiczny Prace*, 33, 1–205, 26 pls.
Théobald, N. (1937) *Les Insectes Fossiles des Terrains Oligocenes de France*. Imprimerie Georges Thomas, Nancy, 473 pp., 28 pls.
Tillyard, R.J. (1919) Mesozoic Insects of Queensland. No. 5. Mecoptera, the new order Paratrichoptera, and additions to Planipennia. *Proceedings of the Linnean Society of New South Wales*, 44, 194–212.
Tillyard, R.J. (1921) Mesozoic Insects of Queensland. No. 8. Hemiptera Homoptera (Contd.) The genus *Mesogereon*; with a discussion of its relationship with the Jurassic Palaeontinidae. *Proceedings of the Linnean Society of New South Wales*, 46, 270–284.
Tillyard, R.J. (1933) The Panorpoid complex in the British Rhaetic and Lias. *British Museum (Natural History) Fossil Insects*, 3, 1–79.
Tindale, N.B. (1945) Triassic insects of Queensland. 1. *Eoses*, a probable lepidopterous insect from the Triassic beds of Mt. Crosby, Queensland. *Proceedings of the Royal Society of Queensland*, 56(5), 37–46, pl. 5.
Tindale, N.B. (1985) A butterfly-moth (Lepidoptera, Castniidae) from the Oligocene shales of Florissant, Colorado. *Journal of Research on the Lepidoptera*, 24(1), 31–40.
van Couvering, J.A. & Miller, J.A. (1969) Miocene stratigraphy and age determinations, Rusinga Island, Kenya. *Nature*, 221, 628–632.
van Schepdeal, J. (1974) Macrolépidoptères fossiles du domaine Paléarctique, La paléontologie au service de l'écologie. *Les Naturalistes Belges*, 55(1), 3–37.
Walker, F. (1854) *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, Part II. Lepidoptera Heterocera. British Museum, London, pp. 279–581.
Wangrin, G. von (1940) Tagfalter–Versteinerung in einer "Stettiner Kugel". *Entomologische Zeitschrift*, 53, 192–194.
Wappler, T., Currano, E.D., Wilf, P., Rust, J., & Labandeira, C.C. (2009) No post-Cretaceous ecosystem depression in European forests? Rich insect-feeding damage on diverse middle Palaeocene plants, Menat, France. *Proceedings of the Royal Society B*, 276, 4271–4277.
Wedmann, S. (2000) Die Insekten der oberoligozänen Fossillagerstätte Enspel (Westerwald, Deutschland). Systematik, Biostratinomie und Paläoökologie. *Mainzer Naturwissenschaftliches Archiv*, 23, 1–169.
Weitschat, W. (2009) Jäger, Gejagte, Parasiten und Blinde Passagiere-Momentaufnahmen aus dem Bernsteinwald. *Denisia 26, zugleich Kataloge der oberösterreichschen Landesmuseen Neue Serie*, 86, 243–256.
Weitschat, W. & Wichard, W. (1998) *Atlas der Pflanzen und Tiere im Baltischen Bernstein*. Friedrich Pfeil, Munich, 256 pp.
Westwood, J.O. (1854) Contributions to Fossil Entomology. *Quarterly Journal of Geological Society of London*, 10, 378–396, pl. 14–18.
Weyenbergh, Jr., H. (1869) Sur les insects fossils. Du Calcaire lithographique de la Bavière, qui se trouvent au Musée Teyler. *Archives du Musée Teyler*, 2, 247–294.
Weyenbergh, Jr., H. (1873) Notes sur quelques insects du calcaire jurassique de la Bavière. *Archives du Musée Teyler*, 3(3),

234–240.
Weyenbergh, Jr. H. (1874) Varia zoological et paleontológica. *Periodico Zoológico, Sociedad Entomológica Argentina*, 1, 77–111.
Weyland, H., Berendt, W. & Peters, I. (1960) Über einige bisher unbekannte Mikrofossilien aus der Braunkohle. *Senckenbergiana lethaea*, 41(1/6), 489–511.
Whalley, P.E.S. (1977) Lower Cretaceous Lepidoptera. *Nature*, 266, 526.
Whalley, P.E.S. (1978) New taxa of fossil and recent Micropterigidae with a discussion of their evolution and a comment on the evolution of Lepidoptera (Insecta). *Annals of the Transvaal Museum*, 31(8), 71–86.
Whalley, P.E.S. (1985) The systematics and biogeography of the Lower Jurassic insects of Dorset, England. *Bulletin of the British Museum of Natural History (Geology)*, 39(3), 107–189.
Whalley, P.E.S. (1986) A review of the current fossil evidence of Lepidoptera in the Mesozoic. *Biological Journal of the Linnean Society*, 28, 253–271.
Wilf, P., Labandeira, C.C. & Ellis, B. (2006) Decoupled plant and insect diversity after the end-Cretaceous extinction. *Science*, 313, 1112–1115.
Wilf, P., Labandeira, C.C., Johnson, K.R. & Cúneo, N.R. (2005) Richness of plant-insect associations in Eocene Patagonia: A legacy for South American biodiversity. *Proceedings of the National Academy of Sciences, USA*, 102(25), 8944–8948.
Willmann, R. (1984) Zur systematischen Stellung mesozoischer und tertiärer Mecopteran einschliesslich *Eoses triassica* Tindale (angeblich Lepidoptera) (Insecta, Holometabola). *Paläontologische Zeitschrift*, 58(3/4), 231–246.
Wilson, M.V.H. (1996) Insects near Eocene lakes of the interior. *In*: Ludvigsen, R. (Ed.), *Life in Stone: A Natural History of British Columbia's Fossils*. University of British Columbia Press, Vancouver, pp. 225–233.
Winkler, I.S., Labandeira, C.C., Wappler, T. and Wilf, P. (2010) Distinguishing Agromyzidae (Diptera) leaf mines in the fossil record: New taxa from the Paleogene of North America and Germany and their evolutionary implications. *Journal of Paleontology*, 84(5), 935–954.
Wolsan, M. & Lange-Badré, B. (1996) An arctomorph carnivoran skull from the Phosphorites du Quercy and the origin of procyonids. *Acta Palaeontologica Polonica*, 41(3), 277–298.
Woodward, H. (1876) On a remarkable fossil orthopterous insect from the Coal-Measures of Scotland. *Quarterly Journal of the Geological Society of London*, 32, 60–65.
Woodward, H. (1878) On the occurrence of *Branchipus* (or *Chirocephalus*) in a fossil state, associated with Archaeonicus and with numerous insect remains in the Eocene freshwater limestone of Gurnet Bay, Isle of Wight. *Geological Magazine*, (2)5, 88–89.
Worobiec, G. (2007) *Laurus abchasica* (Kolakovsky & Shakryl) Ferguson from the Neogene of the Bełchatów Lignite Mine (Central Poland). *Acta Palaeobotanica*, 47(1), 203–215.
Wu, R.J.C. (1997) *Secrets of a Lost World: Dominican Amber and Its Inclusions*. Privately published, Santo Domingo, 222 pp.
Zablocki, J. (1960) *Pinus Króli*, a new species of fossil pine from tertiary salt deposits in Wieliczka. *Studia Societatis Scientiarum Torunensis Sectio D (Botanica)*, 4(4), 43–48, pl. 1.
Zahiri, R., Kitching, I.J., Lafontaine, J.D., Mutanen, M., Kaila, L., Holloway, J.D. & Wahlberg, N. (2010) A new molecular phylogeny offers hope for a stable family level classification of the Noctuoidea (Lepidoptera). *Zoologica Scripta*, 40(2), 158–173.
Zeuner, F.E. (1927) Eine Sphingidenraupe aus dem Obermiozän von Böttingen. *Palaeontologische Zeitschrift*, 8, 321–326.
Zeuner, F.E. (1931) Die Insektenfauna des Böttinger Marmors. Eine systematische und paläobiologische Studie. *Fortschritte der Geologie und Palaeontologie*, 9(28), 1–406, pl. 1–19.
Zeuner, F.E. (1942) Two new fossil butterflies of the family Pieridae. *Annals and Magazine of Natural History*, 11, 409–416.
Zeuner, F.E. (1943) On recent and fossil *Pseudonaclia* Butler (Lep., Amatidae). *Annals and Magazine of Natural History*, 10, 140–144.
Zeuner, F.E. (1960) Notes on the evolution of the Rhopalocera (Lep.). *Verhandlungen: XI Internationaler Kongress für Entomologie*, 1, 310–313.
Zhang, J. (1989) *Fossil Insects from Shanwang, Shandong, China*. Shandong Science Technology Publishing House, Jinan, 459 pp.
Zhang, J., Sun, B. & Zhang, X. (1994) *Miocene Insects and Spiders from Shanwang*, Shandong. Science Press, Beijing, 298 pp., 42 pls.
Zherikhin, V.V. (1978) Development and changes of the Cretaceous and Cenozoic faunal assemblages (Tracheata and Chelicerata). *Trudy Paleontologischeskogo Instituta Akademii Nauk, SSSR*, 165, 1–198.
Zherikhin, V.V. & Sukacheva, I.D. (1973) On Cretaceous "ambers" (retinitis) with insects of North Siberia. *In*: Bei-Bienko, G.Y. (Ed.), *Doklady na XXIV Ezhegodnom Tshtenii Pamiati N. A. Cholodkovskogon*, 1971, 3–48.

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